MICHAEL A. LADRA (State Bar No. 064307)
KENNETH B. WILSON (State Bar No. 130009)
JAMES C. YOON (State Bar No. 177155)
WILSON SONSINI GOODRICH & ROSATI
Professional Corporation
650 Page Mill Road
Palo Alto, CA 94304-1050
Telephone: (650) 493-9300
Facsimile: (650) 565-5100

Attorneys for Plaintiff
SANDISK CORPORATION

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

SANDISK CORPORATION, a Delaware corporation, Plaintiff, v. LEXAR MEDIA, INC., a California corporation, Defendant.	CASE NO.: C98-01115 CRB (PJH) EXHIBITS TO THE DECLARATION OF MARCIAN E. HOFF, JR., Ph.D.IN SUPPORT OF PLAINTIFF SANDISK CORPORATION'S OPPOSITION TO DEFENDANT LEXAR MEDIA, INC.'S MOTION FOR SUMMARY JUDGMENT OF INVALIDITY Date: March 10, 2000 Time: 10:00 a.m. Dept: 8 Before: The Honorable Charles R. Breyer

VOL. II OF III

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Exhibit

SANDISK vs. LEXAR DEPO OF: YUKUN HSIA, Ph.D. V.I 1/27/00

Page 1 to Page 171

CONDENSED TRANSCRIPT AND CONCORDANCE
PREPARED BY:

COMP-U-SCRIPTS
DEPOSITION REPORTERS
1101 S. WINCHESTER BLVD., SUITE D-138
SAN JOSE, CA 95128
Phone: 408-261-9795
FAX: 408-247-0433

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

SANDISK CORPORATION, a Delaware corporation,

Plaintiff,

vs. NO. C98-01115 CRB (PJH)

LEXAR MEDIA, INC., a California corporation,

Defendant./

DEPOSITION OF YUKUN HSIA, Ph.D.
VOLUME I

DATE: January 27, 2000

DAY: Thursday

TIME: 9:42 a.m.

PLACE: Wilson Sonsini Goodrich & Rosati
601 California Avenue
Palo Alto, CA 94304

PURSUANT TO: Notice

REPORTED BY: LINDA LAUBACH, RPR
CSR No. 11590

COMP-U-SCRIPTS
OFFICIAL REPORTERS and NOTARIES
1101 S. Winchester Blvd., Suite D-138
San Jose, CA 95128-3901
(408) 261-9795

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APPEARANCES:

For the Plaintiff: WILSON SONSINI GOODRICH ROSATI
BY: JAMES C. YOON
ATTORNEY AT LAW
601 California Avenue
Palo Alto, California 94304
(650) 493-9300

For the Defendant: FENWICK & WEST LLP
BY: SEAN P. DeBRUINE
and
ANN A. BYUN
ATTORNEYS AT LAW
Two Palo Alto Square
Palo Alto, California 94306
(650) 858-7865

Also Present: MR. CAREY MOOK, Videographer

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THE VIDEOGRAPHER: Good morning. We are now on the record. The time is 9:42. Today's date is January 27th, 2000. We are located at the law offices of Wilson Sonsini Goodrich & Rosati, 601 California Avenue, Palo Alto, California.

This is videotape No. 1 of the videotaped deposition of Yukun Hsia, Ph.D. in the matter of Sandisk vs. Lexar in the United States District Court, Northern District of California, San Francisco Division, case No. C98-D1115 CRB (PJH) (sic).

My name is Carey Mook. I'm a certified legal video specialist and notary with McMahon & Associates, One Almaden Boulevard, Suite 829, San Jose, California.

And in association with Comp-U-Scripts, the court reporter is Linda LauBach, CSR No. 11590 – in association with Comp-U-Scripts, 1101 South Winchester Plaza (sic), Suite D-138, San Jose, California.

Counsel, will you now, please, state your appearance for the record.

MR. YOON: James Yoon for the plaintiff, Sandisk Corporation.

MR. DeBRUINE: Sean DeBruine for defendant, Lexar Media, and for the witness, Dr. Yukun Hsia.

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MS. BYUN: And Ann Byun with Fenwick & West.
THE VIDEOGRAPHER: If there are no stipulations, please, swear in the witness.
YUKUN HSIA,
being first duly sworn by the Certified Shorthand Reporter, to tell the truth, the whole truth, and nothing but the truth, testified as follows:
EXAMINATION BY MR. YOON
Q. Good morning, Dr. Hsia.
A. Good morning.
Q. Is this the first time you've ever had your deposition taken?
A. That's true.
Q. Okay. So we'll go over all the rules. The first rule is that whenever you don't understand something going on, you should ask. Mr. DeBruine and I and Ms. Byun and I have spent a lot of quality time together; and if you need something clarified, just ask.
You understand today that you're under oath.
A. That's correct.
Q. You understand today that everything you say is being transcribed by the court reporter and recorded on videotape.
A. I can observe that.

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Q. Is it your understanding, Dr. Hsia, that after this deposition is over, you'll have an opportunity to review the deposition transcript?
A. I've been told that.
Q. And when you review that transcript, you'll have the opportunity to make any changes you deem necessary.
A. Okay.
Q. Do you understand, though, that the fact that you made changes could be used in a court?
A. I understand that too. Okay.
Q. Is there any reason today that you feel, for health reasons or other reasons, you can't give full testimony?
A. I don't think so.
Q. Now, because the court reporter is transcribing what is said, please, try to give verbal responses. Nodding your head or saying uh-huh, or uh-oh, sometimes creates difficulties on the transcript. So if you could, please, say yes or no or respond verbally.
A. Okay. I'll try that. Just remind me.
Q. Okay. No problem. And, Dr. Hsia, sometimes we get excited and I may start speaking fast or it's unclear. Again, please stop me; and I will repeat the question or rephrase the question until you understand

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it.
A. Okay.
MR. YOON: Okay. I just would like to note for the record, before we begin the deposition, this morning we received a box of documents relating to Dr. Hsia, as I understand it, from the paralegal at Fenwick & West who provided it to us. It's really substantively one-fourth of a box and extra copies of the documents were provided. Those documents are being reviewed right now, and we hope to have the opportunity to ask Dr. Hsia questions on those. It remains to be seen if it is an issue. I just want to state that for the record.
MR. DeBRUINE: Okay.
Q. (By Mr. Yoon) Would you mark – Dr. Hsia, I'd like to hand you a document that has been previously marked as Exhibit 132 to the deposition transcript of Dr. Milton Gosney.
MR. YOON: Can we have this remarked as Exhibit 132.
(Whereupon, Plaintiff's Exhibit No. 132 was marked for identification.)
Q. (By Mr. Yoon) Dr. Hsia, I've handed you a document marked Exhibit 132, United States Patent 4,398,248. Do you recognize that document?
A. Yes, I do.

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Q. Now, just for ease of – your ease and my ease, I've produced a cleaner copy of the '248 patent than was attached to your declaration; and I believe it was attached as Exhibit D to your declaration. Is this the same packet?
A. It looks the same.
Q. Dr. Hsia, if you would, turn to the second page of Exhibit 132, figure 1 of the '248 patent. Do you see figure 1?
A. Yes, I do.
Q. And by – does figure 1 depict what is described in the patent as, I believe, an SSM?
A. That's correct.
Q. Now, what does SSM refer to?
A. Refer to a solid-state memory, if I recall correctly.
Q. So would you understand it if I referred to the SSM as discussing the solid-state memory that is disclosed in the '248 patent?
A. Yes. You can refer to it that way.
Q. Okay.
A. Uh-huh.
Q. Dr. Hsia, if you take a look at column 6 of the '248 patent.
A. Column 6.
Q. 6.

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A. Okay.
Q. And you see it's under the category that says, SSM System Performance Characteristics and Design Features. Do you see that heading?
A. Uh-huh, I do.
Q. And if you take a look at line 36 and 37, there's a sentence that says, "The data format is 16 bits per word."
A. Uh-huh.
Q. Now, is it your understanding that 16 bits is equivalent to 2 bytes?
A. That's correct.
Q. Okay. Dr. Hsia, would you, please, turn to column 7 of the patent.
A. Uh-huh.
Q. There is a table there that says, "SSM Performance Characteristics and Design Features." Do you see that?
A. Uh-huh.
Q. And do you see there's a category there that says, "Data Storage Format"? Do you see that?
A. Data storage format, yes, uh-huh.
Q. What does that refer to?
A. That is basically the format that we're trying to relate to the customer's interface requirements, so that it meet their requirements.

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This is an example that we used and that refer to – this format that they use and we try to match that.
Q. So this would be an example of a customer disk format.
A. Right, uh-huh.
Q. Do you see there there's a word there that says "sector." Do you see that?
A. That's right.
Q. Then it says, "256 words."
A. That's right.
Q. That equals 512 bytes.
A. That's correct.
Q. So that in this example, the customer's data requirement was sectors that stored 512 bytes of data.
A. Uh-huh, in that case. In this particular case, as referred to by this application.
Q. So it's correct to say that in this case and in this application, a sector stored 512 bytes of data.
A. Uh-huh.
Q. Would you answer yes or no.
A. Yes.
Q. Thank you. Now, the next – under it there's the word "block." Do you see that?
A. That's correct.
Q. And it says, "4,096 words."

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A. Uh-huh, yes. I forgot about it.
Q. And those 496 (sic) words is equal to 8K of data; correct?
A. 8 binary K of data, yeah.
Q. Right, 8 –
A. 8 bytes. 8K bytes.
Q. So a block is equal to 8K bytes of data?
A. Yeah, in this case.
Q. Now, above it there's the word – right above sector is the word "subsector." Do you see that?
A. That's correct.
Q. And that says "32 words."
A. That's correct.
Q. And that is equal to 64 bytes of data.
A. That's correct.
Q. Now, the term "sector" in table 1 –
A. Uh-huh, yes.
Q. – was that used because the disk drive format that the customer was using used the term "sector"?
A. That's correct.
Q. And the word "sector" in table 1 referred to the same amount of data as would be stored in a magnetic disk sector; correct?
A. That is my understanding, yes – was.
Q. Thank you. Why don't you keep that in front of you as well, Doctor.

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A. Uh-huh.
Q. I'd like to hand you an exhibit that was previously marked as Exhibit 134 to the deposition of Dr. Milton Gosney, an article dated May 10th to 12th, 1982, entitled Reconfigurable Interconnect for In-silicon Electronic Assembly. I believe I'm reading that correctly.
A. That's correct. That's correct, uh-huh.
Q. Okay.
MR. YOON: I'd like to have that remarked Exhibit 134.
(Whereupon, Plaintiff's Exhibit No. 134 was marked for identification.)
Q. (By Mr. Yoon) Dr. Hsia, if you would turn – oh, just for convention's sake, attorneys sometimes refer to things by Bates number; and the Bates number is just simply the numbering format we use to keep track of the pages.
If you look at the bottom right corner of the pages, you see LEX 2176, 2176A, 2177.
A. I see them.
Q. So that's because, on a lot of documents in our cases, we use this numbering format to indicate where the document was produced by.
MR. DeBRUINE: Jim, if we can just for a moment, I just want to note for the record, the

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document, at least the copy I have, is incomplete. It appears to be missing the last page. There's a figure 14 to this document that doesn't appear in this exhibit. Please tell me that it wasn't omitted from the exhibit.

MR. YOON: Just to let you know with regard to the declaration that we received from Dr. Hsia, we did not have an Exhibit 14.

THE WITNESS: Oh, interesting.

MR. DeBRUINE: I apologize for that. That's interesting because it's in the one – the file-stamped copy that we have. Do you want to just go ahead and have this page copied?

MR. YOON: Yes. Why don't we just have that page copied right now, and I'm going to take a stapler and attach it.

MR. DeBRUINE: Okay.

MR. YOON: That way we'll solve the problem.

THE VIDEOGRAPHER: Do you want to go off the record?

MR. YOON: Yes, why don't we go off the record for one second.

THE VIDEOGRAPHER: We are now off the record at 9:56.

(Whereupon, a short break was had in the

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deposition from 9:56 to 9:59 a.m.)

THE VIDEOGRAPHER: We are now on the record at 9:59.

MR. YOON: Mr. DeBruine had pointed out there was a page missing to what we had marked as Exhibit 134. Actually, just to make it easy so there's no confusion between the exhibit Dr. Gosney was asked about and Dr. Hsia, could you, please, mark that exhibit now 137. So that will be a new exhibit because there was a difference in a page; and then we'll just note for the record that we'll go back and double check to see if Dr. Gosney's exhibit was omitted that one page.

(Whereupon, Plaintiff's Exhibit No. 134 was remarked as Exhibit 137.)

THE WITNESS: Thank you.

Q. (By Mr. Yoon) Dr. Hsia, you've now been marked (sic) an exhibit that has been renumbered as Exhibit 137.

A. Uh-huh, yes.

Q. Do you recognize this article?

A. Yes, I recognize this paper.

Q. Are you an author on this paper?

A. Yes.

Q. Now, this paper was dated May 1982; correct?

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A. Yes.

Q. If you would, take a look at the first page of Exhibit 132 for a second, the patent.

A. Uh-huh. This one here?

Q. No.

A. The patent?

Q. The patent.

A. Okay.

Q. The first page, please.

A. The first page, yes.

Q. Now, that – the patent was filed in October 1980; correct?

A. That's correct.

Q. So this article or paper was authored by you approximately a year and a half after the filing date of the '248 patent.

A. That's correct.

Q. Dr. Hsia, would you, please, take a look at Bates No. LEX 2178, and there is a table 1 that says, "AWSI/MNOS SSM Performance Characteristics and Design Features." Do you see that?

A. Yes, I see that.

Q. Now, it appears that the table 1 in Exhibit 137 and the table 1 in the '248 patent contain the same information regarding SSM performance characteristics and design features. Would you take a moment to

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verify that, please.

A. Let me do that. Looks like a slight difference.

Q. Could you, please, identify that difference for me.

A. I think the read transfer rate has been adjust or changed between the two. One is – one say is 2 megabits per second. The other says 8 megabits per second.

Q. Oh, okay. Thank you.

A. And also latency time is different.

Q. And that would be 128 microseconds as opposed to 32.

A. Right, uh-huh. That's correct.

Q. Okay. But the data storage format was identical between the two tables.

A. The format in the sense of – it probably refer to a slightly different version of design.

Q. But the size of the sector was the same.

A. That may be different. I'm not quite sure. I do not remember what other circumstances that this article table came from or refer to. Because we were using, at that time, two different rates – or we were contemplating two different rate designs. So I don't know which one this refer to. This might be a slightly different one.

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Q. Okay. Well, why don't we take it one at a time. Now, with regards to the transfer rate, the transfer rate as shown in Exhibit 137 is slower than the transfer rate shown in table 1 of the '248 patent; correct?

MR. DeBRUINE: Objection. Document speaks for itself. You can go ahead and answer.

THE WITNESS: Okay. Will you repeat the question again?

MR. YOON: Madam reporter, could you read back the question.

(Whereupon, the following portion was read back by the court reporter:

"Okay. Well, why don't we take it one at a time. Now, with regards to the transfer rate, the transfer rate as shown in Exhibit 137 is slower than the transfer rate shown in table 1 of the '248 patent; correct?")

THE WITNESS: The transfer rate at – this one here, which is what you call Exhibit 137, is at a slower rate than the one in the patent. That's correct.

Q. (By Mr. Yoon) And looking at the average latency time in table 1 of the 1982 article, that latency time is greater than the latency time

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disclosed in the '248 patent; correct?

A. That's correct.

Q. Now, there is the term – if you take a look at the column to the left of the table, do you see the sentence that says, "Initial application of SSM is as a replacement for electro-mechanical disks"?

MR. DeBRUINE: Are we in Exhibit 137?

MR. YOON: In Exhibit 137.

THE WITNESS: That's this one here.

MR. YOON: Yes.

THE WITNESS: Okay. Where are you pointing out?

Q. (By Mr. Yoon) It's about midway through the paragraph –

A. Uh-huh. An electro-mechanical disk, uh-huh. The initial application, yes.

Q. Now, with regards to table 1 in that Exhibit 137, is the term "sector" there used to referring – used to refer to storing the same amount of data as a sector in an electro-mechanical disk?

A. I – the reference implies that, yes.

Q. And is it your understanding that the sector disclosed in Exhibit 137, that's 256 words, would store 512 bytes of data?

A. Yes, uh-huh.

Q. Now, if you look down to the next sentence after

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the one we just discussed, it says, "An interface controller is used specifically to provide for the emulation of existing disk memory interface and a memory stack controller is designed for efficient implementation of memory stack control."

Do you see that?

A. Yes, I see that.

Q. By "emulation," are you referring to the fact that the SSM would receive commands and data in the same format as the electro-mechanical disk from the standpoint of the host computer?

A. That's correct.

Q. With regards to the Hsia patent, the '248 patent, was the device disclosed in that patent also a device that emulated existing disk memory interfaces?

A. Yes, that's correct.

Q. Now, looking at figure 7 of the article, do you see the Byte Serial MNOS Solid-State Memory Functional Diagram?

A. Yes, I see that.

Q. Now, that diagram in figure 7 appears to be a derivative of figure 1 of the '248 patent; is that correct?

MR. DeBRUINE: Objection. Mis – the document speaks for itself. Vague and ambiguous.

THE WITNESS: I guess you may want to

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define what you mean by "derivative."

Q. (By Mr. Yoon) No problem. Why don't you put figure 1 of the '248 patent in front of you as well.

A. Okay.

Q. Now, with regards to figure 7 of the 24 – figure 7 of the article that is Exhibit 137 and figure 1 of the '248 patent, the functional block diagrams appear to be quite similar with the exception of the fact that figure 7 does not include an external DPS.

A. That's correct.

Q. Did you provide figure 7 for this article?

A. Yes.

Q. Did you derive figure 7 from the figure – a figure in the '248 patent?

A. Figure – sorry.

Q. So figure 7 in the article from figure 1 of the '248 patent.

MR. YOON: Could we have the question read back. I think I asked too many things.

THE WITNESS: I think I'm confused.

Q. (By Mr. Yoon) My problem. It's my fault. When you prepared figure 7 of the article, did you derive the functional blocks from figure 7 from figure 1 of the '248 patent?

A. It was very likely that I used – both of this originated from the same drawing sometime prior when

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this was done.
Q. Why don't we put Exhibit 137 down for a second and return to the '248 patent, which is Exhibit 132, and table 7 again, please. I'm sorry. Table 1, which is on column 7.
A. Uh-huh.
Q. Do you recall that – our discussion regarding the blocks storing 8K bytes of data?
A. Yes.
Q. Now, a block would store, under table 1, 16 sectors of data; correct?
A. I did not – I guess. Assuming your calculation correct, it should be correct.
Q. Assuming that 256 divides into 4,096 sixteen times, which I'll represent it does, is it correct that a block would store 16 sectors' worth of data?
A. Yes.
Q. Now, if you turn to column 6 of the patent, if you take a look at line 12 and 13, it says, "The erase command erases a block of 4,096 consecutive words of data."
Do you see that?
A. Yeah, I see that.
Q. So it's correct that the basic unit of erase in the SSM was a block.
A. For this particular example, that's correct.

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Q. Now, there is a – some commands shown above; and one of the commands is a block write command.
Do you see that?
A. I see that.
Q. Now, a block write command would write 16 sectors of data into a block; correct?
A. That's correct.
Q. Now, a sector write command would write one sector of data into the block.
A. That's correct.
Q. And in order to write in that one sector of data, the block would have to be erased prior to the write; correct?
A. That's correct.
Q. Dr. Hsia, if you would, turn to column 8, lines 44 to 48 of the patent.
A. 44, 48. Yes.
Q. Why don't you take a moment to read that. That's the sentence beginning "The control unit interprets."
A. 44?
Q. Yes. It's the sentence beginning –
A. The memory stack control unit is designed to serve with a nonvolatile memory stack. Yes.
Q. Then do you see the sentence that states – and I'll just state it for the record, "The control unit

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interprets basic system read, write, erase and memory reconfiguration commands issued from the interface control unit and generates a series of address and instruction sequences for manipulation of the data files in the memory stack."
Do you see that?
A. Yeah, I see that.
Q. What's your understanding of the term "data file"?
A. Data file means any data or any information that is stored in the memory stack.
Q. Now, could a data file be larger than a block?
A. Yes, it can or it can be smaller too.
Q. So a data file could be as small as a sector.
A. Or even smaller than that, subsector. Depending what you meant, a subsector.
Q. So a data file could be as small as 64 bytes, then.
A. Could be.
Q. And it could be as large as any number of blocks in the array; correct?
A. That's correct.
Q. So it's correct that there's no specific limitation on the size of a data file, other than the maximum capacity of the memory.
A. That's a good point. That's correct.

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Q. Now, in the device disclosed or the example disclosed in the '248 patent, is there any requirement that a data file be stored in a particular location in the memory stack?
MR. DeBRUINE: I'm going to object. Document speaks for itself.
THE WITNESS: I don't understand the question, really.
MR. YOON: Could we have the question read back for a second.
(Whereupon, the following portion was read back by the court reporter:
"Now, in the device disclosed or the example disclosed in the '248 patent, is there any requirement that a data file be stored in a particular location in the memory stack?")
THE WITNESS: I think that it all depend on what you mean by that. Physically, there's no relationship.
Q. (By Mr. Yoon) Well, let's take it one at a time.
A. Okay. That's why I wasn't sure.
Q. I appreciate that, Dr. Hsia. With regards to the device or embodiment disclosed here in the '248 patent, there is no requirement that a data file be

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stored in a particular physical location of the nonvolatile memory; correct?
MR. DeBRUINE: I'm going to object. That's leading. It mischaracterizes the document. The document speaks for itself.
THE WITNESS: Okay. But I –
MR. YOON: Why don't you read the question back. He's just stated an objection; and then if it's unclear, I can rephrase it. One of the things that Mr. DeBruine is doing is just stating objections for the record. Can we have the question.read back.
(Whereupon, the following portion was read back by the court reporter:
"I appreciate that, Dr. Hsia. With regards to the device or embodiment disclosed here in the '248 patent, there is no requirement that a data file be stored in a particular physical location of the nonvolatile memory; correct?")
THE WITNESS: I think the answer is, that is correct, if I understand your question correctly.
Q. (By Mr. Yoon) Okay. Now, I believe that – and you'd probably do a better job explaining this than me. You mentioned that that may not be correct with

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regards to, I guess, the logical address received by the solid-state memory –
MR. DeBRUINE: Object.
Q. (by Mr. Yoon) – is that correct?
MR. DeBRUINE: Mischaracterizes the witness's testimony.
THE WITNESS: The logical address. What do you mean? Try it again.
Q. (By Mr. Yoon) Oh, okay, no problem. And that's what we're here for. Dr. Hsia, you had pointed out something with regards to the physical address. It appeared that there was something that was a nonphysical address or virtual address or something logical that the situation – there may be a particular location for a data file. I was hoping that you could explain that.
MR. DeBRUINE: To the extent that's a question, I'm going to object that it mischaracterizes the witness's testimony. It's vague and ambiguous.
THE WITNESS: I guess it also depending on in what way the overhead data that we added to the data that the computer originally sent to the memory, there's some logical relationship between that.
Q. (By Mr. Yoon) Okay. Now, with regards to that overhead data that you just described, would an example of that be the address that is stored in the

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array controller of the memory slice?
A. There's quite a few different layers of overhead information.
Q. Okay. Could you identify some of them.
A. Okay. They probably not inclusive because, you know, I have to go through it in great detail. But there are some data that are hardwired. For example, I was explaining the patent, the AC address is par– in part hardwired. And there's also another address for the wafer slice or the memory slice, depending on the terminology that you used at the time. And there is also located physically in the hardware; however, it is also modifiable because of the nature of the interconnect. This is why I find your question a little bit difficult to answer because it depend on how you define data. Because those addresses are the memory array, the memory slices. Those address are also stored in the memory somewhere, which could be defined elsewhere.
Q. Okay. Other than the address that's hard wired or reprogrammed into the array controller and the address of the memory slice, are you referring to any other types of overhead?
A. There are other overheads too. You also kind of

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allude to that in the patent, for some of the error encoding and decoding codes that sometimes goes with this memory. This example doesn't show it here specifically; but, you know, there's also those data.
Q. Okay. With the error data and correction, is that referred to as the EDAC, E-D-A-C, in the '248 patent?
A. It refer to it as such. It also – for some, we also became aware of more powerful bits, which we – may or may not be considered part of the EDAC.
Q. Now, the use of the EDAC is not described in detail in the '248 patent; is that correct?
MR. DeBRUINE: Objection. Document speaks for itself. The question's leading.
THE WITNESS: I think that to respond correctly is that the patent itself did not fully describe some of the schemes that are part and parcel of the patent consideration. But because the patent uses one example, whereas, we were trying to make the patent more universal, which is where the difficulty lies.
Q. (By Mr. Yoon) Yes. Now, you mentioned that the overhead is added to the data that the computer host system wants to write; correct?
A. Would you repeat that again?
Q. Correct me if I'm wrong, Dr. Hsia. We had

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several questions. Dr. Hsia, I believe you testified that the overhead that the SSM uses is added to the data that the host system wants to write into memory; correct?

A. That is correct, yeah.

Q. Now, the host – if the host wants to write 512 bytes of memory into the SSM, that would be written into a sector within a block; correct, that data?

A. That data would be written – I would say to be – actually, to be correct, okay, I probably say that the data would be written into the memory stack somewhere.

Q. Right. Now, was it your understanding that the memory stack would write one sector's worth of data into a particular sector within a block located somewhere in the memory stack?

A. You have to repeat the question again. I'm sorry.

MR. DeBRUINE: Let me put an objection on the record for that too. It's unclear to me, Jim, whether you're asking him about specifically the disclosure in the patent or you're just asking about the –

MR. YOON: I'm asking about the disclosure in the patent, the device disclosed in the patent itself.

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THE WITNESS: Yeah, I think has to be – sometimes it's hard to answer the questions that you posed because I'm not quite sure that you're asking a practical example or is it the intent or – of the patent.

Q. (By Mr. Yoon) Let's just discuss right now the particular example that's described in the patent.

A. The practical example.

Q. The particular example that you're describing here.

A. Uh-huh.

Q. In this particular example, if you wanted to write a sector's worth of data from the host system into the SSM, would the SSM write that sector of data into one sector located within a block somewhere in the memory stack?

A. I think that – the answer to that probably should be yes, if I understand your question correctly. Because the sector, though, in the stack itself is distributable anywhere within the memory – not necessarily physically in a contiguous manner in silicon. Am I clear on that?

Q. Yes.

A. Okay.

Q. Now, the – but each block is – in your memory that is described in the example of the '248 patent is

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divided into 16 sectors; correct?

A. Yes, uh-huh. That's correct.

Q. And each of those sectors stores one magnetic disk sector's worth of data; correct?

MR. DeBRUINE: Objection. Mischaracterizes the document. Document speaks for itself.

THE WITNESS: It stores one sector of information as translated by the array controller and by the stack controller in the memory controller.

Q. (By Mr. Yoon) If the host system says write one sector of data into the memory –

A. Uh-huh.

Q. – that sector of data will be written into a single sector located within a block somewhere in the memory stack; correct?

A. In a single logical sector of the memory stack. There's no physical sector in the sense that – because, physically, it could be in separate memory slices.

Q. Uh-huh.

A. Okay.

Q. Yes. But there is a logical –

A. Relationship.

Q. – dividing of the memory stack into sectors; correct?

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A. Logically, yes, but not physically.

Q. Correct. I understand.

A. Okay. Good.

Q. Now, with regards to that logically dividing of sectors, there's also logically dividing of blocks; correct?

A. Yes, correct,

Q. And the smallest unit of erase is a block.

MR. DeBRUINE: Objection. Asked and answered.

THE WITNESS: For this particular example, the smallest unit that can be erased is one block.

Q. (By Mr. Yoon) And in this particular example –

A. In this particular example.

Q. – when that block is erased, all the sectors that are logically associated with that block are erased.

A. That's correct.

Q. Now, you mentioned there was a memory slice address. We discussed that.

A. Yes, uh-huh.

Q. Now, looking at the figures of the '248 patent, where was that memory slice address stored?

A. The memory slice address is stored in the associated decoder, physically, and also somewhere – depending on the way the original computer system's

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set up, we also install somewhere as data in the memory.
Q. Now, where was – if you take a look at column 12 –
A. Column 12. Okay.
Q. – line 67 and 68.
A. Column 12, line 67.
Q. And it actually carries over, I believe, briefly to column 13.
A. Column 13. Okay.
Q. Now, this is the portion of the specifications of the '248 patent that discusses the array controller; correct?
A. This describes array controller example.
Q. Correct. And in the array controller example of the '248 patent, do you see that statement that says, "A programmable memory array map and spare array register"? It's at the very bottom of column 12.
A. Okay. Uh-huh.
Q. What is your understanding of what the programmable memory array map refers to?
A. Let me read the context of this sentence.
Q. Please do.
A. 64, figure 8. I think I have to look on 64, figure 8. There's an array map there that is made up of, in this particular case, MNOS memories.

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Q. And what is the function of the programmable memory array map?
A. I have to take a look at that because this one is referred to figure 8 is a figure of the – is that AC? Let me see the title.
Q. I believe so. If you look at column 12, line 61.
A. Figure 8 is a functional organization of an array controller. Okay. Yeah. That is the memory array that stores information and the names of the memory arrays. Maybe I'm not quite clear. Let's do it this way: That particular device in the AC controller stores the commercial addresses for the MAs associated with that particular array controller. Is that answer clear?
Q. I think so but I'm going to follow up a little bit on this.
A. Okay.
Q. Now, in the example of the '248 patent, how many memory arrays are controlled by an array controller?
A. That actually is illustrated in figure 6.
Q. Okay.
A. Okay. What is it: 16? 1, 2, 3 – I count them. 16.
Q. So each row in figure 6 is controlled by a single array controller.

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A. Each row logically is controlled by one array controller. There's two spares associated with the array controller. So I think it's 16 – 16 by 14 is the array that I used before. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16. So actually in that case, there's 14. It's 14 by 16. I forgot which way goes which.
Q. Okay. So each array controller controlled 14 memory arrays.
A. MAs, yes.
Q. And how many MAs comprised a logical block for array purposes?
A. One MA is one bit in the data stream – is a bit organized internally, so that is one bit.
Q. Now, the programmable memory array map that we've been discussing, does that also include the memory slice address?
A. No.
Q. No. Where would the memory slice address be stored?
A. The memory slice address is stored in the associated decoder, which, in figure 8, would be identified in hardware as 60 and 61.
Q. Now, is both 60 and 61 hard wired?
A. 60 is associated decoder, so it's softwired address, and that actually is prim – so that is

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basically just for the array slice. It is also stored elsewhere too, like for assembly controller. Actually, it's stored in additional space. It's also in the stack itself also, the memory slice address.
Q. Now, the programmable memory array shown in figure 8 and the address decoder, 60, shown in figure 8, you stated had – or used memory stored in the memory slice; correct?
MR. DeBRUINE: I'd object. It's vague and ambiguous.
THE WITNESS: As a matter of fact, the question is – I would say – if I answer your question, it would be no because the array map, as identified in 64 of figure 8, that stores the – that is the conversion map which is for identify and points to MAs associated with the array controller. Whereas, the associated address stored in the associated decoder is the address name of the memory slice; and they're different animals, in a sense.
Q. (By Mr. Yoon) Okay. Now, with the address name of the memory slice that is associated with the associated address decoder 60, that information is stored somewhere in the memory slice; correct?
A. That is – okay – that 60, that address, is in

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order to – that name is stored also in RAM, R-A-M, which is identified in the patent elsewhere, which is the RAM identified as the RAM in – in part 1 of the figures, I think. Do I have it – there should be a RAM somewhere.

Q. Would that be in figure 5?

A. Let me see. It doesn't show in here. It is somewhere. It probably – oh, I remember. It is identified as RAM in the –

MS. BYUN: Column 8.

THE WITNESS: Column 8 RAM file, okay. In the memory controller.

Q. (By Mr. Yoon) Could you, please, identify where you're looking.

A. Column 8, line 64. Okay, that RAM.

Q. Yes.

A. Okay.

Q. So the –

A. And that is also referred to – let's see – here in figure 2 is referred to in the box on 30 – see the RAM there? See, there's two – the reference to stack and the storing RAM.

Q. Yes. So then there's a column in figure 2 called column 30 that says, "Store address table in ram."

A. Right, uh-huh.

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Q. And that is part of the memory set-up instruction.

A. That's correct.

Q. So it reads address table from memory stack.

A. Right.

Q. Now, that address table –

A. Is stored somewhere in the memory stack.

Q. Is that stored as some type of data file in the memory stack?

A. Yes. As far as the memory stack is concerned, it is another file. We can't differentiate what it is, of course.

Q. Okay. Now, with regards to the array controller – and that would be the programmable memory array map that we discussed in column 12 and shown in figure 8.

A. Yes.

Q. Now, you mentioned that that array map points to the MAs associated with a particular address.

A. Associated with the array controller.

Q. Associated with the array controller.

A. Uh-huh.

Q. Now, that array map, where is that stored?

A. This array map?

Q. Yes.

A. You're referring to the array map in 64?

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Q. Yes.

A. It is stored in itself. It is stored in itself.

Q. It's stored in the cell?

A. It is stored in itself. It is in local memory. It is resident in self.

Q. That memory, is that distinct from the memory of the memory stack?

A. That – yeah, this is a – physically a separate array, is a specific physical array in the array controller; and the information is stored in it that identify the arrays that physically tie to it in the row of MA that tie to this memory array.

Q. Okay. So it is correct that the programmable memory array map of the AC is physically distinct from the memory arrays in the stack.

A. I think you have to repeat the question again.

MR. YOON: Can we have the question read back, please.

(Whereupon, the following portion was read back by the court reporter:

"Okay. So it is correct that the programmable memory array map of the AC is physically distinct from the memory arrays in the stack.")

THE WITNESS: Okay. The data that is stored in array map 64 in the AC is different from the

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data information that is stored in MAs. This is what your question is?

Q. (By Mr. Yoon) Yes.

A. It is different.

MR. DeBRUINE: Jim, are you at a point where we can take a break?

MR. YOON: Sure.

THE VIDEOGRAPHER: We are now off the record at 10:44.

(Whereupon, a short break was had in the deposition from 10:44 to 10:54 a.m.)

THE VIDEOGRAPHER: We are now on the record at 10:54.

Q. (By Mr. Yoon) Dr. Hsia, if you take a look at column 9, line 58 to 64 of your patent –

A. Column 9.

Q. Yes. Starting at line 58, it talks about the reconfiguration.

A. Yes.

Q. Why don't you read that to yourself.

A. Okay. Okay. Finished reading it.

Q. Now, you see the statement there that refers to a nonvolatile address file of the SSM?

A. Yes.

Q. What does that refer to?

A. That is – refer to the addresses of replacement

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units and also active units of the memory that is stored in the memory stack. And that also, initially, when the memory is set up, has also been transferred to RAM. The one that we previously talked about, R-A-M.

Q. Okay. Now, was this nonvolatile address file a data file that was stored in the SSM?

A. Yes.

Q. Now, the – column 9 of the patent refers to the nonvolatile address file in the singular. Was there a single nonvolatile address file that was used in the examples shown in the '248 patent?

MR. DeBRUINE: I'm going to object. The document speaks for itself.

THE WITNESS: Which particular one are you referring to, what line item?

Q. (By Mr. Yoon) Okay. If you take a look at line 59 to 60, it says, nonvolatile address file; and if you take a look again, there is the term on line 62, nonvolatile spare address file in the stack. Do you see that?

A. Okay. Let me read this. Okay. On this one here, what actually happens is that the – in order to reconfigure it, you had to know where the spare addresses – spare arrays are and the spare MAs are. And that information is somewhere stored in RAM.

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So we access that to find that; and then after you've done that, you make changes back to the RAM, say, okay, I displayed this defective name – this defective array name. And it has now been replaced by this other array. So that information had to be restored back into the memory stack; otherwise, the next time when the memory get reset up, you lose the configuration of the memory.

Q. Yes. Now, with regards to the creation of the file in RAM, on power up, this nonvolatile address file would be read and its contents would be moved into RAM; correct?

A. That's correct.

Q. Now, was there a single nonvolatile address file in the memory stack that was read in order to create the RAM in the examples shown in the '248 patent?

A. That's correct.

Q. Now, Dr. Hsia, if you would, take a look at column 2 of the patent –

A. Column 2.

Q. – and it talks about – starting at line 49, it says, "Interconnections on the individual memory chips are organized such that small individual sequential access memory arrays, each with a storage capacity in the range of 4K to 16K bits per memory

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array."

Do you see that?

A. Yes, uh-huh.

Q. Now, 4K bits, that is 512 bytes; correct?

A. Oh, we have to be careful on that because – again, right now we're talking about the physical size of the memory of each of the MAs.

Q. Yes.

A. Each of the MAs is 4 binary K bits or 16 binary K bits because that was the technical capability at that time. Okay.

Q. Now, with regards to – and I'm only asking with regards to the physical memory arrays that are discussed in the example of the '248 patent.

A. Right.

Q. The range in sizes ranged from 4K binary bits to 16K binary bits; correct?

A. Yes. That's bits.

Q. Yes. And 4K bits – 4K binary bits is equal to 512 bytes; correct?

A. I think maybe there's a confusion there because the physical structure of this memory – that array in the logical sense is only 1 bit of the data stream. Because every time you access the memory stack, you access 8 MAs.

Q. Yes.

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A. The 4Ks is a single bit out.

Q. Now –

A. Am I clear on that or – I'm really concerned that you –

Q. I'm sure you're clear, Dr. Hsia. I need to get clear myself. This is not a question of – I'm absolutely certain that you're being clear. But let me ask you a couple –

A. Because I'm quite concerned that maybe you're asking something that you do not – or there's a misinterpretation of how the physical MAs tie in with the logical bytes.

Q. Right.

A. That's why I'm a bit concerned about this.

Q. Let's work backwards so that we don't have any confusion.

A. Okay.

Q. So I'm only talking about, physically, the information that's stored in the memory array, and then we'll work our way backwards to how logically they get there. But in the physical – actually stored in the memory cells in the array – in the memory array, each memory array, MA, physically, could store either 4K to 16K bits.

A. That's correct. That's no problem.

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Q. Yes. Physically, 4K bits is equal to 512 bytes; correct?
A. That's where I have some problem with that because the memory is a sequential memory.
Q. Yes.
A. So the output is only 1 bit at a time.
Q. Yes.
A. So you don't count that as a byte in the sense of the system.
Q. Uh-huh.
A. Okay?
Q. Okay.
A. Now, am I – because I'm accessing – when I try to access this memory stack, I access 8 MAs at a time.
Q. Okay.
A. And a byte is – 8 bit-byte is distributed into 1 bit per MA.
Q. I think I understand now.
A. Okay.
Q. With regards to the 8 MAs, which is – basically it would be 1 bit, each would go on to the bus, which would be the byte of data.
A. That's right. Okay. That's why I was concerned about it.
Q. Now I think we – I understand.
A. Okay.

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Q. So that for each of those in order to have a – okay, so it makes sense. So that you have 8 MAs that are accessed for a byte.
A. That's correct.
Q. And you serially are reading out 1 byte at a time.
A. One bit at a time from each array so that you compose 1 byte.
Q. Yes. So in each memory array, 1 bit is read out at a time.
A. That's right.
Q. And 1 byte of information is provided in parallel on the bus from the 1 bit from each memory array; correct?
A. Well, it will come out; and then you will constitute a 1-byte stream of 8 bits going out because it's a serial memory.
Q. Okay. Why don't we take a look at figure 1 for a second.
A. I think figure 1 on the Y, item 14, that's 8 – it shows 8 arrays being – that's a bus size of 8.
Q. Yes. And for those 8 being accessed, there was 1 bit from each of the MAs depicted in the figure transmitted. So 8 bytes are sent to the interface control unit.
A. That's correct.

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Q. And this would be repeated 512 times to send to the interface control unit 512 bytes of data. So, serially, 512 bytes, 1 byte at a time, would be transmitted over 14 to the interface control unit.
A. That's correct.
Q. Okay.
A. Now I think we're clear.
Q. Yes. Thank you. Now, with regards to the MA, the memory array, which physically can store 4K to 16K bits; correct?
A. See, that information – that is a generic statement.
Q. Yes.
A. The example we use assumes an 8K bit MA, if I remember correctly.
Q. So this is an 8K bit MA, is the example.
A. Right.
Q. So that would be –
A. – 4K. So when you access a set of 8 MAs, you end up with 4K words.
Q. Okay. Now, it finally becomes clear to me. Thank you, Dr. Hsia.
A. Okay.
Q. With regards to the 8 MAs – which those 8 MAs would constitute a block.
A. That's correct.

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Q. Thank you.
A. Okay.
Q. And that block would hold 4K words or 8K bytes of data.
A. That's correct.
Q. Okay. Thank you.
A. Okay.
Q. So that when an erase command came, it would erase all the MAs in that block.
A. That 8 MAs.
Q. Right. So it would erase all the 8 MAs associated with that block.
A. That's correct.
Q. Okay. And we discussed earlier that block, or 8 MAs, could store up to 16 sectors' worth of data.
A. Yes, uh-huh.
Q. And by that, that's the data that the host computer system wants to store.
A. Yeah, you've – that's if it asked for one block. It may ask for two blocks.
Q. Okay. But if the host computer system says write one block of data –
A. Then we erase and write one block of data.
Q. And if the host computer says write one sector of data –
A. Then you assume that the host computer know that

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you already have erased previously, and then you can write – there's a special command that was given in figure – as item sector write – some of instructions, depending on the instructions.

Q. Now, in a sector write command –

A. Uh-huh.

Q. – one sector worth of data, would be written into the 8 MAs.

A. Yes. If you move everything into there, yes.

Q. Okay. So that when you read out that sector of data from the MAs, each MA would provide 1 bit, so that 1 byte at a time is read out.

A. That's correct.

Q. Okay. So that it could be a situation where 15/16ths of the available memory in a block is not utilized.

A. Yes, it is possible. If the computer program's written in such a way that they don't use the bounds of the unwritten space.

Q. Okay. Dr. Hsia, if you take a look at column 9 and 10 of the '248 patent, starting at line 67 and going to line 5 –

A. Of column 10?

Q. Yes.

A. Uh-huh.

Q. Why don't you read that to yourself for a

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moment.

A. Yes.

Q. Is there any other discussion in the '248 patent regarding an EDAC or an EDAC unit, other than that discussed in column 9, line 66, to column 10, line 5?

MR. DeBRUINE: I'm going to object. The document speaks for itself.

THE WITNESS: I believe – I believe that that one is put in there to point out the fact that indeed, okay, this is – has been considered. But I do not recall it was detaily (sic) described elsewhere in – within this particular patent description. But it is obvious that it can be done because the way we do our organization is organized where you need this architecture. So it is always that it should be understood readily.

Q. (By Mr. Yoon) Okay. With regards to figure 5 –

A. Figure 5. Uh-huh.

Q. – there is a dotted box that refers to the EDAC squared. Do you see that?

A. Yes, uh-huh.

Q. Is there any other figure in the '248 patent that you're aware of that discloses an EDAC unit?

A. Okay. In that case, it is not described in detail as for this particular example.

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Q. Okay.

A. And let's see what I should say. It's just that it was – at the time, the customer was not interested in that. We have other system built with that in.

Q. When you say "customer," who are you referring to?

A. This patent – this particular example system was designed specifically – or proposed specifically to a customer that are interested in that. We also – at that time, that customer is a minor customer. We have other customers who actually have designed the EDAC requirement into the memory systems, and just we happen to pull this example that is not including the EDAC.

Q. And what customers may have had an EDAC unit designed into an SSM?

A. There is a – as it happens, it was a customer that is a classified customer, U.S. Government; and I believe that we had to report a design report. Was it in the –

MR. DeBRUINE: Jim, I believe what he's referring to were among the documents that we got you this morning.

Q. (By Mr. Yoon) But with regards to your declaration, that report was not attached.

A. In the declaration because I didn't – yes, it

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was not attached in the declaration because I didn't find it until – in my archival storage in my garage. Didn't find until afterwards.

Q. Okay. Now, Dr. Hsia, the – going back to column 9 and 10.

A. Yes.

Q. There's a statement there that says, "coupled with an error memory file." Do you see that? It's column 10, line 1 to 2.

A. Uh-huh.

Q. Was that error memory file a data file?

A. In the context of the memory stack, it would be a data file. It would be stored part and parcel in the memory stack.

Q. Okay. And I see here that the term "error memory file" is singular. Do you see that?

A. Yes.

Q. In the example shown in the '248 patent, was there a single error memory file?

MR. DeBRUINE: Objection. Document speaks for itself.

THE WITNESS: This one here identify a possible option. This relate – this tie in the option.

Q. (By Mr. Yoon) Yes.

A. But in – for example, in the design – a

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different design, for example, that file would be, of course, part and parcel of the file that is – that is referred to earlier.
Because you need to have that integral with the reconfigurations set up in all that. So it should be tied in with the S – with the RAM storage file referred to.
And additional also have to be clear too is that because we're bit organized – so, for example – just a very example is you want to add a parity bit, where often the disk memory have that – that would be – in that case now, for every byte, let's say, you add 1 bit.
So for one you might have 2 bits – 2 parity bits and then in this case, now you're accessing the 8 arrays, you access 10 arrays.
Q. Okay. Now –
A. Just for clarity.
Q. Thank you, Dr. Hsia. With regards to the error memory file that's discussed in the '248 patent, is it your understanding that that file would be transferred to the RAM on the power-up of the system?
A. In the sense that they – for example, in one design, we talking about single error detect and double error detect. So that information had to be stored in the file so that the system, later on, when

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they want to reconfigure the memory because too many errors, then they would know where to access it and to make decisions how to reconfigure.
So that would be part of the file. But that file may or may – may be considered part of the RAM, or it could be considered separately depending on the design and the requirements.
Q. For example, for one design, could the error memory file be stored in the same memory as the array map of the AC controller?
A. No. No. That array map of the AC controller identifies the MAs associated with it, and that is separate entity as compared to the error data file.
Q. Now, you mentioned briefly that – I think you used an example if you used 2 parity bits, you could have 10 MAs.
A. That's correct.
Q. In the example in the patent where 8 MAs constitute a block –
A. Right.
Q. – and that block stores the user – the data from the host computer; correct?
A. That's correct.
Q. There would have to be additional MAs that would be storing the overhead information.
A. Well, I think that maybe – put it another way.

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Let's say that in the case that we need parity bits as required by the system cable – oh, we need parity bits. Then a block, okay, as far as the memory stack is concerned, would compose of 8 – a group of 8 MAs –
Q. Yes.
A. – distributed through the stack.
Q. Uh-huh.
A. Okay. But as far as the system's concerned, okay, they see only what: 8 MAs, in a sense, because they're only sending in that much data.
Q. Yes.
A. But the excess parity bits are indeed stored in the memory stack associated with that particular group of data.
Q. In the –
A. Am I clear on that or –
Q. Yeah. In the '248 patent – just the example disclosed in the '248 patent, no additional memory arrays are disclosed for parity bits.
A. That's correct. I was using example.
MR. DeBRUINE: Objection. The document speaks for itself.
THE WITNESS: I think this is the power of bit organization of this bit memory stack.
Q. (By Mr. Yoon) Now, would the parity bit be

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received from the host computer or would it be generated by the SSM?
A. In one design, it would be specifically generated by the memory controller. It would be invisible to the computer user because we would double check to make sure that the data integrity is there before we send out to the host computer.
Q. Uh-huh. Now, did you actually build a system with parity bits?
A. We design systems, but we actually did not build a system and market as such.
Q. Uh-huh. Now, you mentioned a system that – I have to, during the lunch break, review the documents – no, I appreciate that, Dr. Hsia. But you mentioned a system that was discussed in some report that used EDAC.
A. Yes, uh-huh.
Q. Now, in that system, was there an error memory file that was loaded up on power up into a RAM?
A. You know, I just – in that particular, I haven't gone through in real detail because it was a major, major design effort there.
And I do know, though, the error code themselves are stored in the – in connection with the data into the memory stack; and, additionally, knowing how the design has to be, the information generated by error

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encoding and decoding has to be stored somewhere. And, definitely, it has to be stored in the memory stack.
Q. Now, it's –
A. As a file.
Q. It's stored as a file in the memory stack.
A. Yes. Otherwise, you can't use it otherwise.
Q. And that file is, upon power-up, loaded into the RAM.
A. It has to be loaded into the memory controller, not in any specific RAM, because it may be designed in such a way that it is loaded somewhere else; but it should be in the memory controller.
Q. Okay. So if we take a look at figure 5 of the patent, for example, and – figure 5 of the Hsia patent, that is a functional block diagram for the memory stack controller; correct?
A. Yes, uh-huh. But it is not inclusive as I look because somehow the RAM is not articulated in the figure even though you refer to it over and over again in the memory because it is just memory units. So I guess when we drew that, we didn't think about it specifically; and, similarly, the EDAC is drawn as a block diagram. So it just identified that you will have a lot of data stored in there to execute the EDAC operation.

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Q. In order to execute the EDAC operation, the contents of the error memory file are loaded into the EDAC hardware.
A. Should be.
MR. YOON: I would like to have marked as the next exhibit, which is 138, I believe.
THE COURT REPORTER: 137. Oh, we changed that.
MR. YOON: 137 was the article. This would be the declaration of Dr. Hsia, and we'll have that marked as Exhibit 138.
(Whereupon, Plaintiff's Exhibit No. 138 was marked for identification.)
THE WITNESS: Okay. Thank you.
Q. (By Mr. Yoon) Dr. Hsia, I'd like you to turn to paragraph 15 of your declaration.
A. Paragraph 15. Okay.
Q. Why don't you just hold there, and why don't you take a look at the last page of the declaration.
A. Oh, last page. Sure, uh-huh.
Q. Dr. Hsia, is that your signature?
A. Yeah, uh-huh.
Q. Okay. Why don't you go to paragraph 15.
A. Sure.
Q. Do you see that there's a sentence there starting at line 16 –

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A. 16.
Q. That says, "So that there could be no question of me presenting sensitive information in China, in light of the government sponsorship of much of my earlier work, I took great pains to ensure that all of the material in my presentation had already been publicly disclosed in the United States."
Do you see that?
A. Yes. That's correct.
Q. Now, with regards to that information that was publicly disclosed, was there any information regarding the SSM system that was discussed in China that was not disclosed as one of the exhibits to your declaration?
MR. DeBRUINE: I'm going to object as vague and ambiguous.
THE WITNESS: Are – used specifically the materials on the material sent to China. So that – if you have that as exhibit, I think we have – I gave three distinctly different lectures and each lecture is production material.
I think the exhibits include two of them for sure. One is not related that specifically, so I didn't include it.
Q. (By Mr. Yoon) I understand that. What I'm trying to determine is you submitted a declaration;

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correct?
A. Yes, uh-huh.
Q. And in that declaration, you attached exhibits.
A. That's correct.
Q. And there is a reference to a presentation that you did in China in your declaration.
A. That's correct.
Q. My question is that are you aware of any technical material or information that you may have presented in China that would not be disclosed or discussed in one of the exhibits to your declaration?
A. Other than the one – there's one set – we gave them only two; right? Two sets – I have three sets of view foils, three different lectures. One is on LSI technology; one's on MNOS; one is on WSI. I think we incorporate only two in the exhibits.
MR. DeBRUINE: I think that's the case.
THE WITNESS: So there's one set that's not included here –
Q. (By Mr. Yoon) But with regards to –
A. Within the context of those material.
Q. Yes.
A. – okay, I discuss exactly what was in the view foils presented included in the exhibition – exhibit.
Q. And I think you used the term WSI.

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A. Yeah, wafers systems integration.
Q. Now, would that be the SSM that we've been discussing or an example of an SSM?
A. Yes.
Q. Okay.
A. Or vice versa.
Q. With regards to an SSM or the implementation of a solid-state memory that would emulate a disk drive –
A. Yes.
Q. – did you present any additional technical information in China that is not disclosed in one of the exhibits to your declaration?
A. No.
MR. DeBRUINE: Jim, can I just clarify something for the record. In the lecture notes that Dr. Hsia included in his declaration, there is reference to and some figures incorporated from a 1979 paper. That paper is not part of his declaration. It has been produced to you within the last couple weeks.
MR. YOON: Uh-huh.
MR. DeBRUINE: I'm just –
Q. (By Mr. Yoon) Just to make clear, we'll get to your presentation materials.
A. Okay.
Q. Dr. Hsia, there are references or figures in the

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presentation materials that appear to be from patent or papers; correct?
A. Yes. They're all from patents or papers.
Q. Yes. But other than the papers that may be referred to in the exhibits or the exhibits to your declarations, did you present any additional technical information regarding the operation of an SSM that would emulate a disk drive?
A. That becomes a little bit complicated question because I discuss and presented to them materials that were described in the exhibit, okay. And the lecture material basically are on those material.
Q. Yes.
A. And I don't know whether that answers your question or not. I have to be very careful on what I say on that because of the sensitivity issue on that.
Q. I understand.
A. Okay.
Q. But, for example, do you know whether or not figure 5 of the '248 patent was disclosed in any of your presentation materials?
MR. DeBRUINE: I object.
THE WITNESS: If it's not included in the – I don't think I discuss in great detail, okay, the materials because the nature of the lecture. So I would not very detaily (sic) describe; otherwise, it

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would take forever to describe the subject. So within that sense, okay, I did not use additional graphs or view foils beyond what was given and presented to them previously. I basically used those as my – actually, it was in slides. And I just – I go through the slides, explain to them what they are and what it means; but I do not use additional material beyond – beyond that.
Q. (By Mr. Yoon) So the only topics that you discussed in your presentations were depicted on the slides or notes that you attached to your declaration with regards to the emulation of a disk drive.
A. That's correct.
Q. Do you recall whether or not you had any presentation or discussion in China regarding the operation of an EDAC?
A. Not – not in the extreme details that we've just gone through.
Q. Okay. So the purpose of your presentation was to provide a survey of the technology in the field.
MR. DeBRUINE: Objection. Leading, assumes facts not in evidence, lacks foundation.
THE WITNESS: The objective is actually just – to me, okay, is just like a technical presentation, okay, on subjects of interest to the audience and to me.

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Q. (By Mr. Yoon) And there were quite a number of topics; correct?
A. Yes.
Q. And I believe you testified that you did not go into great detail on any of those topics; correct?
A. Yeah, in that sense, that's correct – in the sense that, you know, it is real difficult when you discuss – you know, given the time constraint and all that, it is difficult to go into great details of the topics involved.
Q. And just out of curiosity, was that presentation made in English or Chinese?
A. I use a mix because I don't know some of the terms in Chinese; but most of the people there were very conversant in English.
MR. YOON: What time is it?
MR. DeBRUINE: It's about 20 to 12:00.
MR. YOON: My stomach is like clockwork. I never carry a watch, but my stomach is like clockwork. A few more questions and then we can take a break. Actually, why don't we go for like five more minutes and then come back at 1:15 because I'm going to have to review the materials, so I might need a little bit longer.
MR. DeBRUINE: Okay.

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THE WITNESS: Sure. That's fine.
Q. (By Mr. Yoon) Dr. Hsia, would you turn to paragraph 9 of your declaration for a moment.
A. 9. Yes.
Q. Now, it says here, this two-step system had the advantage of allowing dynamic reconfiguration of the memory when the memory blocks became defective and the block could no longer store data when the controller detected a defective block.
Do you see that? Paragraph 9, the first sentence, starting at line 22.
A. (Witness reading to himself.) Yes, understand.
Okay.
Q. Now – and also if you want to, just for context purposes, you can read for yourself paragraph 8 of your declaration. You can read that out loud.
A. To use this memory –
THE VIDEOGRAPHER: Excuse me. Could you move your hands away from the microphone.
THE WITNESS: Oh, okay. To use this memory as a replacement disk storage required controller circuitry to accept addresses and commands from computer –
THE COURT REPORTER: Excuse me.
Q. (By Mr. Yoon) You can read it to yourself.
MS. BYUN: You don't have to read it out

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loud.
Q. (By Mr. Yoon) You don't have to read it out loud.
A. Yes. What was the question?
Q. Okay. Now, when the SSM was emulating a disk drive, okay – why don't we look at figure 1 of the patent at the same time, which is on the cover.
A. That makes it easier; right. Okay.
Q. Yes. When the – the external DPS, that's a host computer; correct?
A. That's correct.
Q. So when the host computer sends – I want you to assume no defect yet. We'll go into that in a second.
A. Okay.
Q. When the host computer sends a sector write command and asks you to write one sector of data into the memory stack, that interface control unit would convert that magnetic disk drive address into an address in the physical memory; correct?
A. That's correct.
Q. And that address in the physical memory would be the address of a sector's worth of memory within an 8 MA block; correct?
A. Yes.
Q. So that – now I want you to assume that that data was successfully written into a block of memory

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somewhere in the array.
A. Yes.
Q. After that, there is a read sector –
A. Uh-huh.
Q. – command from the host computer system.
A. Uh-huh.
Q. That would read the data located at the physical address that was previously written to; correct?
A. Yes. Let me – it will try to retrieve the information that was stored in the MAs. It has to be the same locations.
Q. Right. So that was the previously addressed MA.
A. Right. Assuming that there's no other changes, like the configuration and all that.
Q. Assuming that the configuration hasn't changed –
A. And all that.
Q. – and all that, it would be from the same physical address as before.
A. That's correct.
Q. If then for that same magnetic disk sector address, there's a new write command that is issued –
A. Okay.
Q. – and an error is detected in the memory stack for the physical address that was previously written to – let me take that back, my question.

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In order to write the data – new data into that group of 8 MAs –
A. Uh-huh.
Q. – that group of 8 MAs would have to be erased first; correct?
A. Oh, yes. You have to assume that is the case; otherwise, it cannot be written correctly. It all depends on what the command previews was. This would all depend on the skill of the programmer, for example.
Q. Right. So if you wanted to write new data into that same physical location, the block where that data was located would have to be erased first; correct?
A. That's correct; otherwise, you –
Q. Okay. And if that block was successfully erased and no defect would occur, it would write that same sector of information into the same physical address that was previously written to; correct?
A. Yeah, that is correct.
Q. Just – I'm not sure that was clear on the record. Was that a yes?
A. Yes. I need to speak louder.
Q. Assume that if a defect is found in the block –
A. I think you have to first be able to detect the write. You have to read from it first to find, oh, okay, there's an error by – according to the EDAC.

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Q. Okay. Let's say that there's an error found or detected.
A. Okay.
Q. The device disclosed – the SSM disclosed, would dynamically change the physical address associated with that magnetic disk sector address; correct?
A. If there's a command saying that, indeed, okay, this error is unacceptable, we need to reconfigure it – this depends on the intelligence of the host computer in the end – then, yes, it would be – then the memory would be reconfigured in such a way that the physical – that address, the same address physically, would address a different set low rate.
Q. And that's what you mean when you refer to dynamic reconfiguration in paragraph 9 of your declaration.
A. In a sense, yes.
Q. So dynamic configuration – reconfiguration refers to dynamically changing the physical address associated with the magnetic disk sector address.
A. I guess the word dynamic may be a – I guess – I guess may be misleading or may be confusing. Let me see how it's written again. Where's the line now again?
Q. Line 2.
A. Okay, yeah. I think it just describes the

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dynamic process, okay, to allow reconfiguration. This is an adjective, in that sense.
Q. Okay. But in the context of the SSM that's described in the '248 patent, there is not a – necessarily a fixed relationship between the magnetic disk sector address and a physical memory address; correct?
A. That is correct.
MR. YOON: Why don't we take a lunch break. Back at 1:15.
THE VIDEOGRAPHER: We are now off the record at 11:44.
(Whereupon, a lunch break was had in the deposition from 11:44 a.m. to 1:15 p.m.)
THE VIDEOGRAPHER: Good afternoon. We are now on the record. This is the beginning of tape No. 2 of the videotaped deposition of Yukun Hsia, Ph.D., in the matter of Sandisk vs. Lexar on January 27th, 2000.
Q. (By Mr. Yoon) Good afternoon, Dr. Hsia.
A. Afternoon.
MR. YOON: During the break, I made a – the attempt – my eyes will attest, a Herculean attempt – to go through the materials that we received today, this morning, that you referenced a little earlier during the morning part of the

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deposition.
Although I have managed to skim the material, I did not get the opportunity to really analyze in any great detail what was disclosed. And none of those materials were attached as an exhibit to your declaration.
So as such, Sandisk reserves the right to call back Dr. Hsia sometime subsequent to the summary judgment briefing or hearing at a mutually agreed upon time to ask maybe additional questions; but that will be decided and discussed by counsel at a later date.
THE WITNESS: Okay.
MR. DeBRUINE: I'll just note for the record that those documents appear to be beyond the scope of the document request served on Dr. Hsia; and whether there's any need for or basis to call him back, we'll raise at another time.
MR. YOON: Yep. Fair enough.
Q. (By Mr. Yoon) Why don't we do something easy to start off with so my eyes can recover here.
MR. YOON: We're on exhibit what number?
THE COURT REPORTER: We are on 139.
MR. YOON: I'd like to mark as Exhibit 139 a document entitled Yukun Hsia resume.
(Whereupon, Plaintiff's Exhibit No. 139 was marked for identification.)

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MR. DeBRUINE: And I'd like to note for the record, Jim, if you haven't noticed, that the back half or third of that document appears to have picked up portions of a brief in a completely unrelated matter.
MR. YOON: That was actually –
MR. DeBRUINE: That was a copying error on our part that we only discovered yesterday.
MR. YOON: That was my question. I was going to ask Dr. Hsia in his spare time had he gone to law school. Okay. So we will take off the documents.
THE WITNESS: Detach. Okay.
MR. YOON: And I have no desire to read about another case that I'm not involved in.
MR. DeBRUINE: That was a fun case. The prior art was Sesame Street.
THE WITNESS: Oh, really.
MR. DeBRUINE: It validated prior art, as a matter of fact.
Q. (By Mr. Yoon) Dr. Hsia, now given – as now presented to you, is Exhibit 139 familiar with you – to you?
A. Yes. It is familiar to me.
Q. And this exhibit is your resume.
A. Yes, uh-huh. I'm just curious as to – is this a duplication? This part here, the last page? That's

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interesting. Okay. Sounds fine. It's kind of redundant information here and there for some reason. I don't know why. Must be the file I sent you because I sent it through electronic file. So replicate a couple times.

Q. (By Mr. Yoon) Dr. Hsia, why don't we take a look at the second to last page of your resume or the group of documents describing your experiences and education.

A. Okay.

Q. Dr. Hsia, is that your current address at the top of that exhibit?

A. Yes.

Q. Now, Dr. Hsia, it states that you have over 30 years experience in engineering and management.

A. That's correct.

Q. How many years experience do you have with computer memory systems?

A. Well, actually, that would be interesting question. Let me think. I start working on memory systems at National Cash Register in 1961. And various times, I've been using and working with memories. So I would say that, you know, until – until I join Northrop – actually, until I joined – see, I still work on memories. I guess I've been working

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with memories all this time, one way or another. Maybe that's the best way to answer.

Q. So would it be fair to say that you have at least 20 years experience in computer memories?

A. Yeah, uh-huh. I would say so.

Q. And you have a Ph.D. in solid-state electronics from UCLA.

A. That's correct.

Q. And it's correct to say that you're the inventor on 11 patents.

A. Actually, now it's 12. I just got another patent in December of this past year.

Q. And did that patent relate to memory systems?

A. That one actually is a medical unit – medical equipment – medical imaging equipment. It uses memory, of course, but –

Q. But would it be fair to say that you are the named inventor on at least 12 patents?

A. Yes.

Q. And approximately how many articles have you published?

A. Last count, I think is 38, depending how you count the articles.

Q. And, Dr. Hsia, you are a senior member of the IEEE.

A. Yes.

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Q. And it's correct to say that you served on the standards committee of the IEEE relating to MNOS memories.

A. Yes.

Q. And the standard committee of the IEEE relating to EPROM standards.

A. Actually, later on they changed the name to floating gate devices. I'm not quite sure of the exact name now.

Q. So that you served with regards to the IEEE on a standards committee relating to floating gate devices.

A. Yes, that's the EPROMs and the –

Q. Would that include EEPROMs?

A. Yes.

Q. And at the time did that include flash EEPROMS?

A. Yes. I think that you probably would be able to – those standards were published already. So you probably would have no problem finding it on IEEE's. I tried to locate them but couldn't find them in my file the other day.

Q. Dr. Hsia, have you earned or received any awards with regard to some of the work that you've done in the past?

A. Well, actually, variously, in a sense. For example, a magazine did award me a product of the year award in 1977, per the resume. And then there's also

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some company awards, which, you know, is not spelled out anywhere here but they're kind of minor awards, I guess.

Q. Are you referring to the second page of Exhibit 139 that refers to the Electronic Products Magazine selected the NCM 7040 for a product of the year award?

A. That's correct.

Q. Now, was the NCM a WSI/SSM-type memory?

A. No. At the time, it was just a memory device award.

Q. By device, do you mean a memory chip?

A. It was a memory chip, nonvolatile semiconductor memory, specifically MNOS devices.

Q. Dr. Hsia, you handed me your business card today, and it referred to YHL and then it says, "consulting partner."

A. That's correct.

Q. What is YHL?

A. It's a partnership I own and formed years ago. I think since the '80s.

Q. Okay. And what's its primary function?

A. It primary function is with – I do consultant, technically and also do investment with that particular partnership.

Q. Should have invested in Sandisk stock. They're up 25 today.

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A. Is that right?
Q. With regards to YHL, do you do any design consulting work?
A. I did.
Q. When was the last time?
A. Quite a few years back.
Q. Okay. Are you being compensated in any way today for your testimony?
A. Yes.
Q. And how are you being compensated?
A. My normal consulting rate.
Q. And your normal consulting rate is –
A. Which is $120, which is twice what the promise (phonetic) charge. My promise charge me a dollar a minute, so I figure I should charge at least twice that.
Q. As I'm sure – although maybe they haven't told you, you're a bargain, given what some of the people are paid nowadays.
A. I know. I just do it for fun.
Q. With regards to the $120 an hour, are you being compensated for your time at this deposition or also your time prior to the deposition?
A. Both.
Q. Both.
A. Uh-huh.

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Q. To date, approximately how much have you been compensated?
A. I have billed for, I think, about $2,000 so far.
Q. Okay.
A. I have not received anything yet.
MR. DeBRUINE: I object. Move to strike.
Q. (By Mr. Yoon) What can you expect from a place that doesn't pay its associates a living wage. So approximately – that $2,000, that's approximately 15 or 16 hours?
A. In that range, more for the transit to be.
Q. Okay. So do you recall when you were first contacted by someone associated with Lexar?
A. No. Lexar?
Q. Sorry. – from the law firm of Fenwick & West.
A. Yes, by the – it was a phone message left behind.
Q. And do you recall when that message occurred, approximately what month?
A. Gee, November, December. I forgot. It was sometime in the later part of last year.
Q. So November or December of 1999?
A. I think – I believe so.
Q. At any time, did you ever receive a copy of a Sandisk patent that is commonly referred to as the '987 patent?

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A. Yes, uh-huh.
Q. In addition to the '987 patent, did you receive any materials from the law firm of Fenwick & West?
A. Material, in what sense?
Q. Any written materials.
A. We communicate by e-mail.
Q. Okay. And we received several e-mails this morning. Were those copies of e-mails you received?
A. Yes, uh-huh.
Q. In addition to those e-mails and the '987 patent, did you receive any other type of document or information from Fenwick & West?
A. Draft copy of this declaration.
Q. And a copy – a draft copy –
A. See, I forgot. I forgot whether it was transmitted through e-mail or through U.S. mail. I forgot that. Is it by e-mail?
MR. DeBRUINE: I'm not allowed to testify.
THE WITNESS: I forgot. It was somehow transmitted to me.
THE COURT REPORTER: You all cannot talk at the same time.
THE WITNESS: Okay.
MR. YOON: We were out of order.
THE WITNESS: We're trying to remember how the declaration, the first draft, was transmitted to

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me. I forgot how exactly it was transmitted.
Q. (By Mr. Yoon) Now, Dr. Hsia, a copy of that draft was provided this morning as well.
A. Right.
Q. Okay. With regards to that first draft, did you type in that draft?
A. No. No.
Q. Was that draft of your deposition typed in by someone associated with Fenwick & West?
A. I presume so.
Q. Did you provide or receive any type of outline of that declaration prior to reviewing a draft?
A. No.
Q. Did you – how were you involved in the preparation of that first draft of the declaration?
A. Okay. Sean came down, visited me in my office.
Q. Uh-huh.
A. And then we discuss the lawsuit involved.
Q. Uh-huh.
A. And then afterwards, he said we would come up with a draft on what we talked about of this, you know. Subsequently, he – I acquire a copy of that –
Q. Uh-huh.
A. – and make revisions on it to make sure it's accurate –
Q. Uh-huh.

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A. – as much as I can, and I think it's gone through a couple revisions. And I think you might have copies of that that we provided you.
Q. Okay. Thank you. So it's correct to say that based on conversations you had with Mr. DeBruine, Mr. DeBruine or somebody associated with Fenwick & West prepared the initial draft of your declaration.
A. That's correct.
Q. You mentioned that you and Mr. DeBruine may have discussed the lawsuit.
A. Yes.
Q. What do you recall Mr. DeBruine saying to you about the lawsuit?
A. He basically say that there is this company that is – basically have a patent which appear to be worded similar to the one that I had previously issue.
Q. Uh-huh.
A. And he wanted me to study and review it and find the differences or the similarities.
Q. Uh-huh.
A. And we discussed, you know, how different, how similar it is.
Q. Uh-huh. What were the differences that you had identified regarding your patent or your materials and the Sandisk patent?
A. I think that, in my mind anyway, I think the

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difference is in the way – the way it's written in terms of emphasis.
Q. Okay.
A. The Sandisk patent appear to emphasis – emphasize the software, if I remember, aspect of the design; whereas, I'm – I came from a hardware background, so the emphasis on the hardware.
Q. What other differences did you identify?
A. I think other difference – other differences is that the system design, being an auto memory, when I was doing it – it was – the prime example I used was in MNOS.
Whereas, the Sandisk one, you know, by the time the patent written, MNOS is already out of favor. So the auto memory that was used were the EPROMs.
Q. Were there any other differences?
A. And my emphasis was on the interconnect architecture, which, of course, now is partly because of my early interest and long-term interest in the silicon machine concept that I've been proposing in various places and various documents.
Q. Any other differences that you noticed?
A. I guess those are the main differences.
Q. Now, why don't we take a look at your declaration for a second.
A. Okay.

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Q. Go to paragraph 10.
A. Uh-huh, okay.
Q. The first sentence there says, We also anticipated that at least error correction codes, open parentheses, ECC, referred to in the '248 patent as Error Detection and Corrections or "EDAC" would be stored in the memory blocks, along with the data from the host computer.
Do you see that?
A. Yes, uh-huh.
Q. What did you mean by the word "anticipated"?
A. Actually, I think that, in the sense that we actually have done that, maybe a better word would be – we also have – I guess anticipate mean we may not be – let me think.
I should have said we also have designed in another system, okay. I shouldn't say anticipate because the word is not as good as I – in terms of the meaning, now that you ask the question.
Q. Uh-huh. I understand. With regards to the '248 patent, there is no disclosure in that patent about the storage of ECC codes in the memory blocks; correct?
MR. DeBRUINE: I'll object that the document speaks for itself, mischaracterizes the document, and to the extent it's calling for a legal

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conclusion.
THE WITNESS: I guess in the sense that in terms of the exact description of how the ECC codes are to be utilized and stored, it did not specifically – it was not particularly articulated out in the patent.
But I – at the time, actually, it seemed to be a very obvious thing in the sense that we actually had done another system that had the ECC codes. So it was not considered a major issue.
Because the way the memory stack is organized is a bit-organized structure. So ECC codes are very easily implemented by simple additions of another array in connection with the data that was being put together.
Q. (By Mr. Yoon) Okay. But, now, I'm not asking you with regards to – obviously, you've mentioned the other system. But there is no express discussion of the storage of ECC in memory blocks in the '248 patent; correct?
MR. DeBRUINE: I'll object. Restate my past objections and that it's asked and answered.
THE WITNESS: I agree with him. I already answered that in the sense that we did not articulate how in what specific manners, but it is always from the organization of the memory stack since it's

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bit-organized. And the ECC code is just an additional bit column to be used with the memory rates.
Q. (By Mr. Yoon) But, for example, in the block of the '248 patent –
A. Uh-huh.
Q. – that we discussed earlier which stored 16 sectors' worth of data –
A. Uh-huh.
Q. – in that block itself, as disclosed in the '248 patent, there is no room for ECC; correct?
MR. DeBRUINE: Objection. Asked and answered. The document speaks for itself.
THE WITNESS: Okay. The way this particular example is used to illustrate the concept, it did not – since the example happened to be based on the system built for a particular system, and this is not something that asked for ECC codes. So because of that, it did not incorporate – in the example in the description, it did not incorporate the details of that.
Q. (By Mr. Yoon) Okay. Thank you. Now, we had discussed the – or you had mentioned another system that may have had ECC code in it because of the bit organization. Do you recall that?
A. That's correct.
Q. That other system, was that – was there

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actually a working prototype of that system built?
A. There was a design also; however, the funding did not forth come to support the design – I mean the construction of the prototype.
Q. So it was a design proposal that discussed using ECC.
A. It was a design that was funded, but the construction of the end system was not funded.
Q. Okay. Was that, the design of that system, disclosed in any article that you published?
A. I think it was alluded to in an article which probably was provided to you also in the articles listed in my resume as one of my publications.
Q. Could you possibly point that out?
A. I'm not quite sure which particular one. We did have a copy of that particular article.
Q. Was it –
A. Maybe John can help me to locate it.
Q. Well, John's not testifying but –
A. Well, I'm just wondering maybe if he can just help me because it's in one of the – maybe it's in one of the papers that you have.
Q. Okay. Maybe, and I'll try to get the materials out.
A. It shows a long system that have 72 bits per word –

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Q. Uh-huh.
A. – I think and that also is described in detail on that particular report, I think –
Q. Okay.
A. – that we provide you recently.
Q. Yeah. Now, was that article attached to your declaration?
A. I don't really recall exactly. That's one of the problems I have.
Q. Let me just –
MR. YOON: Why don't we have marked as –
THE WITNESS: Let me –
Q. (By Mr. Yoon) Actually, Dr. Hsia, why don't you take a moment to review your declaration.
A. Sure, uh-huh.
Q. So see if that article – anything in that declaration refreshes you as to what that article might be.
MR. DeBRUINE: Jim, it might be helpful to put the exhibits to his declaration in front of him, so he can look and see –
THE WITNESS: That would be much nicer.
MR. YOON: I will be happy to do that.
THE WITNESS: Let's do that. Then I can find maybe easier. All right.
MR. YOON: That would be easier. Okay. I

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would like – I've already, just for the record, handed the witness Exhibit A, which was the resume to the declaration. And Exhibit, I believe, D, which was the '248 patent. So I'd like to mark next in line which should be Exhibit 1 –
MR. DeBRUINE: – 40.
MR. YOON: 140, Exhibit B to Dr. Hsia's declaration, which is an article entitled Advanced Memory Boram Application using MNOS Technology.
(Whereupon, Plaintiff's Exhibit No. 140 was marked for identification.)
THE WITNESS: It's definitely not this one here.
Q. (By Mr. Yoon) It's not Exhibit 140.
A. No.
Q. Okay. We'll take it one at a time.
MR. YOON: I'd like to hand you the next exhibit, which would be Exhibit C to your declaration, an article entitled Silicon Machine a Reconfigurable On-the-Wafer Interconnect Architecture for VLSI Systems. And this will be marked as Exhibit 141.
(Whereupon, Plaintiff's Exhibit No. 141 was marked for identification.)
THE WITNESS: This doesn't discuss that article.
MR. YOON: Okay. So let me hand you

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what's marked as Exhibit 142, that was Exhibit D – E, Exhibit E, as in elf, to your declaration.

(Whereupon, Plaintiff's Exhibit No. 142 was marked for identification)

THE WITNESS: Not this one either. It's not this one either.

Q. (By Mr. Yoon) So it wasn't Exhibit E to your declaration, which was Exhibit 142. Let me hand you now what has been marked previously as Exhibit G to your declaration.

MR. YOON: Have it marked as Exhibit 143, a presentation entitled Wafer Scale Integration. And that was Exhibit G to your declaration.

(Whereupon, Plaintiff's Exhibit No. 143 was marked for identification.)

MR. YOON: Just for the record, Exhibit 137, which we've already looked at, was Exhibit F to Dr. Hsia's declaration.

THE WITNESS: Okay. This is –

Q. (By Mr. Yoon) That was Exhibit G.

A. G. And you have another one?

Q. But the article – I have one more coming. But the article was Exhibit F to your declaration. The article that's right there, that was Exhibit F to your declaration.

A. This was one here. It's not this one here either.

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MR. YOON: And the last exhibit, which was Exhibit H to your declaration, a presentation entitled Nonvolatile Semiconductor Memories by Yukun Hsia.

(Whereupon, Plaintiff's Exhibit No. 144 was marked for identification.)

Q. (By Mr. Yoon) Why don't you take a moment to look through that.

A. That one will be a little while.

MR. YOON: We can go off record and the tape while he's looking through that.

THE VIDEOGRAPHER: We are now off the record at 13 – excuse me – 1:49.

(Whereupon, a short break was had in the deposition from 1:49 to 1:53 p.m.)

THE VIDEOGRAPHER: We are now on the record at 1:53.

THE WITNESS: A quick review of the exhibits appear that that particular design is not disclosed in the exhibits attached to the declarations, other than maybe a reference to a particular site of reference in the resume.

Q. (By Mr. Yoon) But with regards to the exhibits that were attached, as opposed to something referenced in the resume, there wasn't a discussion of adding any type of ECC bits for error correction.

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MR. DeBRUINE: Objection. Vague and ambiguous.

THE WITNESS: That's different. What I'm saying is that there was a discussion, as we already said in the declaration order; but that particular example does not appear to be included in the exhibits. Okay.

Q. (By Mr. Yoon) Yes. And that particular example being an EDAC unit that needs ECC bits that are stored with the data.

MR. DeBRUINE: Objection. Mischaracterizes the witness's testimony.

THE WITNESS: Okay. The additional articles, together with the data work that was sent out by the computer, there is that description of that particular figure that I'm looking at, did not seem to have been included in the exhibits. Okay.

Q. (By Mr. Yoon) Yes. And with regards to those exhibits and that material, you don't recall presenting anything in China regarding such error correction bits, do you?

A. That's correct.

Q. Okay.

A. Unless it's in here.

Q. Okay. Now, with regards to the design that you discussed that wasn't built but you had done – had

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receive some funding on – do you recall that –

A. Yes.

Q. – in your earlier testimony? Was one of the documents you've produced today related to that design?

A. I believe. We can take a look.

Q. I'm going to hand them to you. I just wanted to make sure it was in this morning's one as opposed to something that may have been added earlier.

A. Yeah. I wasn't quite sure how extensive the other material from Sean, so we have to take a look at that. Because I think it was a published paper that has that too. I wasn't quite sure whether it was included or not.

MR. YOON: Sean, because of my secretary not being here, I would ask you to share these exhibits with the witness because I only have two copies.

MR. DeBRUINE: That's fine. It was my understanding that four copies were delivered today.

MR. YOON: But one we got all marked up and I – this is just the copies that we have here. So I need to keep a clean copy or my paralegal would kill me. Always a thing to avoid.

Okay. I'd like to mark as the next exhibit, which is Exhibit 145, a document that is

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entitled Adaptive Integration Technology Development, Volume III, Mass Memory System Description, Part 1, May 23rd, 1979.

(Whereupon, Plaintiff's Exhibit No. 145 was marked for identification.)

THE WITNESS: Okay.

MR. YOON: What number was that?

THE COURT REPORTER: That was 145.

Q. (By Mr. Yoon) Dr. Hsia, is this the design that you were – we were discussing earlier?

A. Oh, yes, uh-huh.

Q. And this is the one that included error correction code.

A. Yes, I believe so. I'll look for it, though. Okay. You can refer to page 2.2.

Q. That's the error detection correction circuits.

A. Correction circuits. Uh-huh, and the codes is nested within the 72-bit board.

Q. Okay. Now, with regards to Exhibit 145, where did you find this material today – or I'm sorry. Not today. Where did you find this material?

A. I found it in my archival storage at home a few days back as I got ready for the trip.

Q. Do you know whether or not this exhibit was ever publicly disclosed?

A. I believe that this figure – this particular

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figure was published in the application. I'm trying to remember which one it is, though. Maybe it's included in the other package. I'm not quite sure.

Q. Okay. Let's take that one at a time, then.

A. Sure.

Q. This document, as a whole, Exhibit 145, so this entire document, that is approximately 150-some pages long, this document –

A. Yes.

Q. Was this document ever publicly disclosed?

A. I do not think this document by itself was publicly disclosed.

Q. And was this document at the time the result of work that was considered classified?

A. It is a declassified copy of some classified work – of then classified work.

Q. And do you recall when this work became declassified?

A. I do not know.

Q. Do you know if it became declassified subsequent to 1990?

A. Well, it has to be declassified subsequent to 1979.

Q. Yes. But do you recall or have any understanding as to when it became declassified?

A. I did not track that.

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Q. Okay. Do you know who you could check with to determine when it became declassified?

A. I think that you might still get hold of W.A. Geideman. In terms of he might be able to refer you to somebody else, et cetera.

Q. Okay.

A. He is the chief engineer.

Q. And who was he a chief engineer with?

A. McDonnell Douglas at that time.

Q. Do you know where Mr. Geideman is today?

A. That I don't know, but I presume that he's still living in Orange County.

Q. Orange County.

A. Santa Ana. Last time I communicated with him – that was a couple years back – he was still at McDonnell Douglas, which now is known as Boeing.

Q. Yep. So it's correct, though, at the time this document was created, it was classified.

A. This document itself is not. The work related to that was.

Q. Okay. Was this document itself publicly disclosed?

A. That would be a difficult question to answer depending on what you mean by what public is. Because it's meant to be distributed as a document for people who were interested in it. So in that sense, it's

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publicly disclosed, maybe. I don't know.

Q. That's for Sean and I to argue, I guess. Let me ask you, who was the intended audience for this document?

A. Actually, anybody who's interested in mass memory systems. That's what was the purpose, you know, extract all the classified work.

Q. Now, this date here, May 23rd, 1979, is that the date that it may have become accessible to people?

A. Well, this particular document, of course, is published on the date. So the draft copy was probably done earlier than that.

Q. Do you know if this document was provided to any library or – who would retain a copy of this document?

A. You know, I did not really – at the time that interested in the distribution of this particular document, so I really don't know. I just know they've been passed out, and I got a copy. But I did not – as a matter of fact, it is 1 of 8 volumes; and I think that I only have one or two of these volumes in my file. I don't remember who sent me them. It was just distributed to people who are interested in certain aspects of the design.

Q. Okay. And, now, was this document done within McDonnell Douglas?

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A. No. For example, I believe that probably – my guess, okay – I shouldn't say definitely know; but I believe that volume 6 may have been done by a subcontractor.
Q. Uh-huh.
A. I think it was Link Up (phonetic), if I recall correctly.
Q. This document was created, though, while you were working at McDonnell Douglas; correct?
A. Yes.
Q. And this was –
A. Let's see, yes.
Q. And this document was – what was your position at McDonnell Douglas when this was prepared?
A. I was in charge of the laboratory and in charge of the hardware design of this. I forgot exact title, if that's what you're looking for.
Q. But this document was prepared in conjunction with a project on behalf of McDonnell Douglas.
A. That's correct.
Q. And do you know whether or not McDonnell Douglas distributed this document to anyone outside of the company who did not have some type of nondisclosure obligation?
A. Oh, I would not know. I'm quite sure, though, probably copies of this have been given to the

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customer community. If nothing else, just to market the project.
Q. And you don't know whether or not such customers were required to sign an NDA before they received a copy of the document.
A. Normally, they don't request that. McDonnell Douglas deal with customers who usually don't want to sign that.
Q. But you don't know one way or the other. And you, yourself, were not involved in the distribution of this document.
A. No.
Q. Now, did McDonnell Douglas ever build a system according to this design?
A. Not to my knowledge, in terms of building it.
Q. Now, with regards to the system that's discussed in this document, Exhibit 145, could the ECC information that's stored in the memory already be erased separate from the data it's associated with?
A. Okay. The way ECC work is that it is for each word – let's say that in this case, you know, 64-bit long, there will be an 8-bit ECC code –
Q. Yes.
A. – that is attached to the word. And in the normal operation, when you want to erase the data associated – that particular data, then you

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automatically erase all of the ECC code; otherwise, the ECC code have no meaning anyway. So you erase together in conjunction with that.
Q. Could you erase the ECC code separately from data?
A. Technically, you could. I mean if you give it some special instructions, you probably could; but actually, there's no real reason for doing a separate erase of the ECC code, as far as I can tell.
Q. So if I understand it correctly, your testimony is that you're not aware of any logical reason why you would erase the ECC separate from the data.
A. The ECC code associated with the word; that's correct.
Q. But you don't know whether or not – was it – putting aside whether or not it was reasonable to do it, it is correct to say that you could erase the ECC code separate from the data.
A. If the customer specifically request me to do that, I'll do it for them. Okay. Technically, it's doable. I know exactly how to do it in a sense.
Q. So the system had the flexibility to erase the data separate from the ECC and the ECC separate from the data.
MR. DeBRUINE: Objection. Vague and ambiguous as to "system." Mischaracterizes the

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witness's testimony.
THE WITNESS: You see the – it depend how you want to implement the design.
Q. (By Mr. Yoon) Yes.
A. If you do not ask me to do it – it is not an easy job to do, but you still can get around it to do it if you want to do it. Okay.
Q. Yes.
A. That's clear; right?
Q. Yes.
A. Okay.
Q. Now, we talked about the design earlier where each memory array had 1 bit of information. For example, in the '248 patent, we had 8 memory arrays to provide 1 byte of information. Do you recall that?
A. Yes.
Q. In the system discussed in this patent here – not patent, excuse me – in Exhibit 145, were there 72 memory arrays that were together in a row?
A. Yes, as utilized – I'm trying to take a look at this, and I'm looking at this and it shows 8 – 8-bit long.
Q. Right.
A. Which implies that the – probably the reason for that is we had only eight at a time; and then for one more, you had to do nine times. See a –

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Q. You had to do nine reads.
A. Nine reads to get the 72 bits of word out. So, okay.
Q. Now, would the – in the discussion here, is the unit of erase smaller than the 72? For example, could you erase 8 at a time or did you erase 8 at a time?
A. I think that I haven't had a chance to really fully review the final design. Memory, this becomes a rather detailed study. I haven't had a chance to look at this since I recovered this report not too long ago.
And, basically, if you want to erase this, okay, I know the previous one, I recall the design is such that we talk about single word erase. So I'm not quite sure exactly in this particular spell out document, whether that is implemented or not here.
Q. But –
A. But you can definitely – technically can do that.
Q. But if a single word erase is implemented, 8 MAs at a time would be erased; correct?
A. Portions of it. If a single word, okay –
Q. Yes.
A. – then portions of that could be erased. Okay. This is assuming that you have separate modes – separate block within the MA, okay. So it depending

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on how the final decision was made, and I just couldn't recall exactly at this time.
Q. And I appreciate that. Trust me, I spent the whole lunch trying to do this. So we may have to have an additional discussion at a later time with regards to that. But I want to make sure we get through all the material related to the summary judgment motion.
A. Okay.
Q. But as you understand it, at least in this time frame, there was also a consideration as to what you referred to as a single word erase.
A. Yes. And, actually, it was spelled out in the other document, also, which is the other design report that you have copy of.
Q. In a single word erase, a portion of 8 MAs would be erased together; correct?
A. That's correct.
Q. And, therefore, in a single word erase architecture, you would have to perform – erase 9 separate words in order to erase the 72 bits.
A. As a group, yes.
Q. Yes.
A. And this is where the – I think that we – now that memory come back a little bit, we actually – that was one of the reasons we were talking about a subsector versus a sector, I think, in some of the

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documents here. And that was try and attempt to do a partial erase of the whole array.
Q. And, obviously, the document speaks for itself, and we may have to come back and discuss it.
A. And I have to double check whether it's incorporating this particular design or not.
Q. But as you sit here today, you're not certain one way or the other as to what the unit of erase was in this design.
A. I do not recall exactly how this design from final implement, since it's done so long ago.
Q. And do you believe that if you had an opportunity to review this exhibit, you'd be able to refresh your recollection as to how that was – that erase was performed?
A. I hope so.
Q. Since we don't have a lot of time, I think we'll move off of this exhibit right now.
A. Sure.
Q. Dr. Hsia, you're familiar with EEPROM memories.
A. Yes.
Q. And EEPROM memories are typically byte-writable and byte-erasable; correct?
A. Uh-huh, as far as I know.
Q. And in a byte-writable/byte-erasable EEPROM, you would erase 8 bits of data at a time; correct?

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A. Uh-huh, uh-huh.
Q. So that would be analogous to doing a single word erase in the MNOS technology; correct?
A. It is performed in a similar fashion by accessing the substrate of the device, yes.
Q. Okay. And at the time of Exhibit 145, you were aware of EEPROM memories; correct?
A. I believe so.
MR. DeBRUINE: Excuse me. Can I have that question and answer read back, please.
(Whereupon, the requested portion was read back by the court reporter.)
THE WITNESS: 145 is '79. Yeah, I think that that's a good point. Because the exact time of which I'm aware of EEPROMs – they are not – is somewhat wane because I am keenly aware of that technology –
Q. (By Mr. Yoon) Yes.
A. – in terms of exact commercial reliability and all that, I'm not – I just cannot place the time. Because even as early as when I was working in the industry, I actually went to Intel at the time to try to interest them in doing MNOS.
And at the time they knew that, and they already – disclosed to me, they were working on EPROM devices because at that time their technology was far

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behind where we were.
Q. Okay. Now, when you say EPROMs, are you referring to EEPROMs or EPROMs?
A. At that time, when I visited Fruman and Crosky (phonetic) and Intel, they were primary working on the EPROMs at the time that.
Q. That's the UV-erasable one.
A. The UV-erasable one. Okay. And at what time – what specific time I know of the EPROM, that is something that is hard to recall at this time because I hope that I'm aware as soon as it's published, but you know never.
Q. No, I understand. I just want your best recollection.
MR. YOON: Okay. Let's do the next one here. Let's see. Sequentially – I would like to have marked as Exhibit 146 a document labeled McDonnell Douglas, entitled MDAC Solid-State Memory Development, May 19th, 1980. And it's Exhibit No. 146.
(Whereupon, Plaintiff's Exhibit No. 146 was marked for identification.)
Q. (By Mr. Yoon) Dr. Hsia, this is one of the documents that were provided to us today; correct?
A. I presume so. I think so, yeah.
Q. Now, Exhibit 146 is entitled MDAC Solid-State

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Memory Development. Do you see that?
A. Yes, uh-huh.
Q. Was this document publicly available from the McDonnell Douglas company?
A. You know, again, in terms of public, you know, it is very kind of an interesting definition, since it's not a classified document and is probably generally distributed pretty widely. And as a matter of fact, I kind of think I did not sign for this particular document. The signature's not mine. So it was just prepared, somebody signed for me.
Q. But I notice that this is Mr. Geideman, again.
A. He's my boss. So I presumed – it was probably done and published, and they wanted to issue as soon as they can; and I was probably out of town or something. So it's not my signature, just in case there was a question about, okay.
Q. That does appear quite different. Now, again, so Mr. Geideman or McDonnell Douglas, itself, would be the best source to determine how and where it was distributed.
A. I believe so.
Q. Now, does this document disclose a system?
A. Actually, this is the document based on which I think the example was used.

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Q. That's what I was going to ask you. So was this the system or the example that was discussed in the '248 patent?
A. Yes. I think the lawyers who prepare the patent application were given this, and he used that as a basis to develop the patent.
MR. DeBRUINE: Dr. Hsia, I'm going to advise you simply not to discuss what you may have – discussions you may have had with McDonnell Douglas attorneys in connection with the patent application process.
THE WITNESS: Okay. I understand.
MR. YOON: And I'm not seeking that, so that's fine.
Q. (By Mr. Yoon) But, Dr. Hsia, would you, please, turn to page 2-6 or LEX 15008.
A. Okay.
Q. Do you see table 2-1 there?
A. Uh-huh.
Q. Why don't you compare table 2-1 to table 1 of the '248 patent.
A. Okay.
Q. I believe the numbers performance characteristics and design features are identical between these two documents. Why don't you take a moment to confirm that.

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A. As it turns out, is not.
Q. Wait a minute. This is the one that was discussed in the article. I'm sorry.
A. Right. So this one – this one here probably was used for the article for sure, obviously.
Q. Right. That's the numbers in the article.
A. So this other one may be a revised version.
Q. Okay. Now, with regards to the device that's disclosed in Exhibit 148 –
A. Uh-huh.
Q. – did that device use error correction coding?
A. This device here?
Q. Yes.
A. Gee, I have to take a look at it; but if I recall correctly, okay, it may not. I'm not quite sure. Let me flip through real fast.
Q. I would direct you to page 2-14.
A. 2-14, okay. Okay. Then most likely, since it's attached, it probably was suggested but not implemented in the design.
Q. And if you take a look at figure 2-7 in Exhibit 146 and take a look at figure 5 of the '248 patent.
A. I'm trying to find out – you're referring to the patent; right?
Q. Yes.
A. Yes, okay.

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Q. And that's – the patent is Exhibit 132. Why don't you take a moment to look at that; and if you could, identify any differences between them, other than the fact that a different type font was used.
A. Would you – I did not follow your numbers.
Q. I'm sorry. If you take a look at page LEX 1516.
A. 1516, I have that. Okay. 16, ah-ha.
Q. That appears to be very similar to figure 5 of the '248 patent.
A. Yes,
Q. Could you take a moment –
A. Very similar.
Q. Could you take a moment to identify any functional blocks that may be present in one document and not in the other.
A. They're the same, as far as I can tell. This one just tells you a little bit more on this one here (indicating). Okay. As a matter of fact, this one has a little bit more in the design part.
Q. Now, the – on page 2-14, there is the word "interface controller." Do you see that?
A. Yes, uh-huh.
Q. Now, that's the interface between the memory stack controller and the interface; correct – interface controller?
A. Let's say –

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MR. DeBRUINE: I'm going to object as vague and ambiguous. I don't think I followed that question.
MR. YOON: Okay. Let me just ask it again so it's clear.
Q. (By Mr. Yoon) Do you see the dotted line that says "interface controller"?
A. Yes, uh-huh.
Q. That line depicts the interface or the communication between the memory stack controller and the interface controller; correct?
A. Let me take a look. I'm not quite sure what you mean there. I don't recall that figure here. I have to find that system block diagram again to see where this one fits.
This interface controller function which buffers to the external DPS and – okay. I believe – I'm trying to find out how this tie together.
Q. If you take a –
A. I think this one refers to – that interface controller, probably refer to figure 2-3.
Q. Okay. And what page is figure 2-3 on?
A. Figure 2-3 is on 2-7.
Q. Okay. Now, if you take a look at page 2-7, for a second – if you took a look at page 2-7 and would you take a look at figure 3 of the '248 patent.

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A. Uh-huh.
Q. So that is – they appear to be the same functional block diagram.
A. That's correct.
Q. Substantively.
A. That is correct.
Q. If you take a look at page 2-2, figure 2-1, that appears to be figure 1 –
A. Uh-huh.
Q. – of the '248 patent with the exception that instead of external DPS, it actually identifies the specific system –
A. Correct.
Q. – that it was hooked up to.
A. Uh-huh.
Q. Does this refresh your recollection as to whether or not this particular device was the basis for the examples shown in the '248 patent?
MR. DeBRUINE: Objection. Lacks foundation, mischaracterizes the witness's testimony, and asked and answered.
THE WITNESS: I was going to say objection.
MR. YOON: Why don't you read the question back.
(Whereupon, the following portion was read

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back by the court reporter:
"Does this refresh your recollection as to whether or not this particular device was the basis for the examples shown in the '248 patent?")
MR. DeBRUINE: Same objections.
THE WITNESS: Yeah, it is the basis. It may not be the exact same system in the sense that, you know, since it's for patent application purposes, you use an example. So how exactly that duplicates a system design is hard to ascertain at this time.
Q. (By Mr. Yoon) If you turn to page 2-16 in this document, do you see the paragraph right before "memory slice" that says, "a possible option"?
A. Uh-huh.
Q. That text appears to be identical to the text found in the '248 patent on column 9, line 67 to column 10, line 5.
MR. DeBRUINE: I object. The documents speak for themselves. Jim, do you really want this witness to read those two line by line and –
MR. YOON: It's only two sentences. He can do it. I just want to see if he identifies any differences. That's all.
MR. DeBRUINE: I would ask that we have a little consideration for the witness's time.

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MR. YOON: I understand.
MR. DeBRUINE: Explicating documents is not what he's here for – copy reading.
THE WITNESS: They appear to be similar.
Q. (By Mr. Yoon) Okay. Does that sentence refresh your recollection as to whether or not the EDAC unit or the use of an error file is discussed in any detail in Exhibit 146?
MR. DeBRUINE: Objection. Lacks foundation, mischaracterizes the witness's testimony.
THE WITNESS: I would say that this one suggests an option, okay, which, obviously, that is an option. To what extent the option is later on discussed, I guess, the document will probably show.
Q. (By Mr. Yoon) Okay. That's fine.
MR. YOON: I think that's the next one. I'd like to have the next exhibit, which is marked Exhibit 147, a document entitled Project 779 Design Review, 19 to 20, January 1982.
(Whereupon, Plaintiff's Exhibit No. 147 was marked for identification.)
Q. (By Mr. Yoon) Dr. Hsia, I believe that's another one of those documents that we received today; is that correct?
THE WITNESS: I think so, yes.
MR. DeBRUINE: Object that it calls for

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speculation.
Q. (By Mr. Yoon) With regards to this document, Dr. Hsia, do you recall the circumstances of its creation?
A. It was so long ago, it's hard to remember.
Q. I understand.
A. But I think – see, I hold – this is one of the design reviews on this project that is called 779.
Q. Yeah.
A. And you have many – through the course of my work, I hold many, many design reviews. So this is one of the meetings. But, specifically, how it came about and all that, you know, it's hard to remember.
Q. Do you recall whether or not this review was provided to individuals outside of McDonnell Douglas?
A. It is unlikely, my guess; but at least there's a roster on the meeting.
Q. Okay.
A. And since it is not a classified document, any of those people can reproduce them and distribute them. So maybe that's the best way to present – to consider this document.
Q. But you don't know whether or not such distribution actually occurred.
A. I do not know. My guess is that, you know, probably at least have been passed along. For

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example, some of those people probably pass on to the technical people.
Some of the managers probably don't read it themselves, they just say, hey, you know, read this report, you know. What is it?
Q. I understand that. And do you have any understanding as to whether or not any of these individuals were under nondisclosure obligations to McDonnell Douglas?
A. I wouldn't know. I wouldn't know. I see some of the people's names.
Q. Again, I notice that Mr. Geideman is listed on this.
A. Sure.
Q. So we may be able to get more complete information regarding access and distribution from Mr. Geideman or McDonnell Douglas.
A. He may or may not.
Q. Okay. Dr. Hsia, do you know whether or not the design and operation of an EDAC unit is disclosed or discussed in Exhibit 147?
A. I think that this project – actually, if I remember correctly, that's the project that requires an EDAC, if I recall correctly.
To what extent that – on this particular day, whether that is a subject of interest or not, I will

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have to take a good look at it and find out.
Q. And do you know how the – assuming that such an EDAC was used, do you know how that EDAC operated?
A. Yeah. That would be basically by adding additional nonvolatile bits to the words and then use them in the EDAC systems.
Q. And do you know whether or not such a system would be word-erasable?
A. I have to take a really good look at that to find specifically if this one here is discussed or not or is included in the material or not, item by item, to find out.
And this may not because it appear to be quite early in the stage; but the configuration shows memory slice and let's see – let me see.
Offhand venture would be that it probably did not specifically deal with single-word-erase issues in this particular meeting, just offhand looking at the data information.
Q. Now, Dr. Hsia, in the devices that were built – SSM devices that were built, I want to distinguish between logically erasing a group of data together and how the physical erase operation occurs.
A. Okay.
Q. Now, did the device, the SSM, physically simultaneously erase one word at a time, one sector at

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a time or one block at a time? Do you know?
A. Let's see. You're talking about disk memory – or which memory are you talking about? Maybe you can rephrase the question.
Q. Let's talk about, first of all, the '248 patent. We'll go one by one. The example that's discussed in this patent –
A. Right.
Q. – would all the memory cells of the block erase simultaneously, or was there a sequential erase operation that erased in smaller units than the block?
MR. DeBRUINE: Objection. Document speaks for itself.
THE WITNESS: I believe that in this particular document, referring to the particular example that was used –
Q. (By Mr. Yoon) Yes.
A. – it assumes a block erase but not sector erase. Because in figure 2, it spell out what it's designed for.
Q. Now, figure 2 discusses the operations that occur.
A. Right.
Q. Okay. Now, those are the functional operations one step at a time.
A. Okay.

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Q. Correct?
A. Yeah, uh-huh. It shows for simple memory erase operations, erase memory block. Okay. And you do – you erase – you erase a block, okay.
Q. Now, with regards to the erase of a block –
A. Yes.
Q. – I understand that an operation would occur where the entire block is erased; correct?
A. Entire block –
Q. Was erased?
A. – of the data is erased.
Q. Do you know whether or not that erase occurred one word or smaller units at a time or whether or not all the memory cells associated with that block were erased simultaneously?
MR. DeBRUINE: Objection. It calls for speculation. The document speaks for itself. The question doesn't make any sense.
THE WITNESS: The erasure would erase 8 array.
Q. (By Mr. Yoon) So the erasure would erase –
A. One block at a time.
Q. So it would erase 8 MAs at a time.
A. Yes.
Q. Okay. That erasure would occur simultaneously.
A. Yes.

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Q. Dr. Hsia, how are the memory cells in an MNOS cell erased in terms of what operation occurs to remove or add charge from the cell to erase the data?
A. You basically apply a voltage to the substrate and hold the ground and then force the traps out of the insulator.
Q. So the substrate would hold the charge.
A. The charge would dissipate into the –
Q. Into the gate?
A. To erase, okay, there's trapped charges. Those charges will be extracted from the traps and – through the application of a voltage to the substrate as versus to the gate. The gate would be grounded.
Q. Now, in order to perform an erase operation on the 8 MAs, was – a charge was applied to the substrate of all the cells in the MA and the gates for all those cells in the MA were held to ground.
A. Yes. It's not charge. It's voltage.
Q. Voltage. Thank you.
A. Sorry.
THE WITNESS: You mind if I refuel coffee?
THE VIDEOGRAPHER: Do you want to go off the record?
MR. YOON: Yeah, why don't we do that.
THE VIDEOGRAPHER: We are now off the record at 2:40.

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(Whereupon, a short break was had in the deposition from 2:40 to 2:43 p.m.)
THE VIDEOGRAPHER: We are now on the record at 2:43.
Q. (By Mr. Yoon) Dr. Hsia, why don't you turn to – I need to find the right one. One second here. Here we go. Dr. Hsia, please turn to Exhibit 143.
A. Yes.
Q. Would you take a look at – there is a slide presentation that's presented on LEX 8543.
A. 8543, yes.
Q. Yes.
A. Uh-huh.
Q. There is a box that is shown in the right-hand corner under the title AWSI Packs More Components and Functions Into a Given Volume. Do you see that?
A. Yes.
Q. And that box has an array engine, an IO engine, and a bus interface. Do you see that?
A. Yes. Uh-huh, yes.
Q. Now, Dr. Hsia, what was the function of the device that's shown in that figure?
A. Okay. It is generic representation of electronic system. It also could represent, for example – the array engine, for example, could be the memory arrays, the MAs, the EGs in that.

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Where the IO engine would probably control the array; whereas, the bus interface, of course, manages the interface to the computer.

Q. Okay. Now, Dr. Hsia, I'd like to hand you an exhibit that we received today, and I'd like this exhibit marked next in order which is –

MR. YOON: What's the next exhibit?

THE COURT REPORTER: 148.

MR. YOON: 148.

THE WITNESS: Didn't we have 148 before? I thought I remember.

MR. DeBRUINE: I think you were talking about 146 and you might have said –

MR. YOON: 147, 146 – yeah, 148 appears to be the next exhibit.

THE WITNESS: Okay. Sorry.

MR. YOON: And if I was discussing an Exhibit 148 earlier, that's referring to Exhibit 146; although, I don't recall that.

(Whereupon, Plaintiff's Exhibit No. 148 was marked for identification.)

Q. (By Mr. Yoon) Dr. Hsia, I've handed you – I'm just going to state for the record what it is.

MR. DeBRUINE: Can I have a chance to look at it?

MR. YOON: I'm just going to read the

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title. I wasn't going to ask him a question. So it will save us some time.

Q. (By Mr. Yoon) Dr. Hsia, I've handed you an exhibit marked 148 entitled Impact of MNOS/AWSI Technology on Reprogrammable Arrays, by yourself and a Roman Fedorak.

A. Fedorak.

Q. Fedorak. Thank you. Dr. Hsia, would you, please, turn to page 13.

A. 13, yes.

Q. Do you see that there is something referred to in figure 9 and the text above it as "two 3-inch square AWSI motherboard modules could replace most of the present correlator and memory electronics."

Do you see that?

A. Which one's that?

Q. I'm sorry. You should allow Mr. DeBruine to see it as well.

MR. DeBRUINE: That's fine.

Q. (By Mr. Yoon) It says there –

A. Okay. I'm sorry.

Q. If you look at the paragraph there, it's the third sentence in the full paragraph there. It says, "A preliminary review of the DSMAC suggests that, based on MNOS/AWSI technology, two 3-inch square AWSI motherboard nodules could replace most of the present

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correlator and memory electronics of the Block 1 NAC system."

Do you see that?

A. Yes, I see that.

Q. The AWSI motherboard module, do you see that shown in figure 9?

A. Yes.

Q. That module is shown in Exhibit 143 as well, isn't it?

A. It's a similar drawing in the sense it represents an edge conductor card, which we call a motherboard.

Q. And what function did the AWSI module perform in the device disclosed in Exhibit 148?

A. On this one here, let's see. It appear to say – on this particular one here, it basically indicating that this particular design in this concept would appear to be able to perform the same electronic function as required of a correlator and memory for this particular Block 1 NAC system.

Q. So, effectively, that each motherboard was a microcomputer system.

A. In this case now, it does – it does data processing operations.

Q. It does data processing operations.

A. Yeah, which includes, of course, memory and

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processing the data. Okay. Go ahead.

Q. And in this particular system, the AWSI motherboard module did not emulate the operation of a disk drive.

A. In this particular one, as is described in this particular manner, is a representation saying it is a subset – actually, is a subset of a certain machine. And this one here, will be more computation-intensive compared to being a memory-intensive.

Q. So with regards to the device disclosed in Exhibit 148, the AWSI motherboard module did not perform the function of a mass storage memory that emulated a disk drive; correct?

A. For this particular –

Q. Yes.

A. – representation, yes.

Q. Are you aware of any AWSI motherboard module that was used to emulate the operation of a disk drive?

A. When you say "aware," that's interesting question. Basically, we are hoping in the long-term – okay, the idea was you could just have a little card. When we have this efficient density, we should be able to put in as mass memory, which would be disk memory. But for this particular application you refer to, though, is this one here, is not for

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that.
Q. Yes.
A. In figure 9 of this particular one.
Q. As of the time you made the presentation in June 1984, in Exhibit G, did – yes – did you or anyone else build a 3-inch AWSI motherboard card that emulated a disk drive?
A. Not build one.
Q. No.
A. Be efficient to do it.
Q. Are you aware of any article that disclosed using a motherboard card – a 3-inch motherboard card, for example, to emulate a disk drive?
A. Okay. Could you repeat that. I must have missed the first part.
MR. YOON: Why don't you read the question back.
(Whereupon, the following portion was read back by the court reporter:
"Are you aware of any article that disclosed using a motherboard card – a 3-inch motherboard card, for example, to emulate a disk drive?")
THE WITNESS: Well, as a concept, we talk about doing something of that nature; but in terms of physical, we haven't a device. It did not exist at

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that time.
But as a design concept that we really would like to do in the end, just like having a 3-inch card for a computer, et cetera.
Q. (By Mr. Yoon) I understand that. Do you recall any article where you – you or anyone else disclosed using a motherboard card or a 3-inch card SSM to perform the function of a mass storage device?
A. The – you know, that's a packaging concept.
Q. Uh-huh.
A. So as a concept, people very interested in possibly to do that. In terms of article describing it, you probably in various format in my experience – I really cannot recall precisely whether they exist or not in the true sense.
Q. Do you recall making any presentation in China where you informed the audience that this 3-inch card that's shown in Exhibit G could be used to emulate a disk drive?
A. Okay. Maybe I could put it another way and say that this is the material I presented in China. Is that correct, yes, okay. And it represents, okay, what the future would be; and I might or might not have mentioned specifically this replacement. But I probably would say electronic system, okay, that implies, of course. Now it could be a

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memory, it could be a computer, et cetera. And this is the general tendency that I would present the silicon machine concept, which basically says that the first realization of that probably will be a mass memory.
Because that's the easiest thing to do because you duplicate MAs much simpler. So in that sense, I might have presented it to the audience.
Q. But you don't recall any specific statement that a mass memory storage device using the silicon machine concept could be placed on a 3-inch card.
A. I cannot specifically remember specifically in those – in that way. But the intention probably exist that I would have said it because I was pushing very hard for the silicon machine concept. And the silicon machine concept, in the end, would be something very easily structured, very easily applicable; and as a matter of fact, I think that was one of the charms for the students was to say, hey, let's build this memory as the first implementation of the silicon machine. And there was a long-term goal to implement a restructurable computation architecture.
Q. But based on my review of the material, one of the strengths that you emphasized regarding the silicon machines was that it was a very flexible

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design that could be reconfigured to multiple applications.
A. That's correct. And, of course, at that time memory is replicable. So that would be – always I tell people that's the easiest thing to do.
Q. Let's take a look at – going back to Exhibit 146.
A. Okay. That's the same exhibit.
Q. No, this is the May 1980 document.
A. May 1980 document. This one here.
Q. Yes.
A. Okay.
Q. Now, if you take a look at page 2-28, it shows the figure 2-11.
A. Okay.
Q. It shows the anatomy of a memory slice. Do you see that?
A. Yes, uh-huh.
Q. Now, that would – multiple memory slices were put together to constitute a memory stack; correct?
A. That's correct.
MR. DeBRUINE: Objection. Vague and ambiguous.
Q. (By Mr. Yoon) But in the design discussed in Exhibit 146, multiple memory slices were combined to form a memory stack; correct?

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A. Yeah, at the time the technology goes for that.
Q. So if you take a look, then, at page 2-30 –
A. Uh-huh.
Q. – that depicts the memory stack; correct?
A. Uh-huh.
Q. Now, all the memory slices in that stack were soldered together; correct?
A. They are used as a memory stack that would be somewhat interconnected. That's correct.
Q. And that was at the time – and I understand that processing technology's gotten a lot better – but at the time, it was – what were the approximate dimensions? It appears to be approximately 3.4 by 5.5 by 6.8 inches; correct?
A. It shows in the figure those are the dimensions for a particular system of interest to the customer.
Q. Why don't we take a look at Exhibit 147.
A. Okay.
Q. If you take a look at pages – page LEX 15168. Do you see that?
A. Yes, uh-huh.
Q. It shows 8 memory slices.
A. Uh-huh.
Q. Are all 8 of those memory slices soldered together in this design?
A. They demonstrate – it is a conceptual design

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that basically shows them interconnected together.
Q. If you take a look at the memory stack which is shown on page 15160 –
A. Yes.
Q. – that shows for that particular design all the memory slices soldered or connected together; correct?
A. It is a ruggedized mercury system concept.
Q. Now, let's take a look at the page 15158 for a second.
A. Yes.
Q. This figure here shows a single memory slice; correct?
A. Yes, that is the silicon slice.
Q. So it would take multiple of these slices to be combined together in a memory stack; correct?
A. For this particular design, yes.
Q. Yes. Now, with regards to a mass storage memory system that emulated a disk drive, do you recall whether or not any system was built on a single card?
MR. DeBRUINE: Objection. Asked and answered.
THE WITNESS: In terms of basically having one built –
Q. (By Mr. Yoon) Yes.
A. – and used, I don't think so.
Q. Okay. With regards to – going back to Exhibit

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G and page LEX 8543, do you see that?
A. Yes.
MR. DeBRUINE: Hang on a second. Exhibit G.
MR. YOON: Exhibit G. That's one of the presentation materials that had the wafer scale integration.
THE WITNESS: This one here.
MR. DeBRUINE: The one in front of me.
Q. (By Mr. Yoon) That presentation relates to just the different packaging options available to AWSI technology; correct?
A. Actually, that particular one represents a specific packaging approach –
Q. Okay.
A. – which basically saying that we can illustrate the progress and how much ready it is now to try to attempt to do a single card in electronic system as compared to the, quote, unquote, olden days where you used devices; and they go into the cards which expands the volume significantly.
Q. So with regards to the bottom row here, that was referring to what was called the old LSI technology.
A. And, actually, that was the then state of the art.
Q. That was the then state of the art, and that

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state of the art resulted in the use of multiple cards that were connected together in a system.
A. That's correct.
Q. And the benefit of AWSI was it allowed you to integrate into a smaller area the same function.
A. Yes.
Q. But the disclosure in – on page LEX 8543 was not related to any specific application but instead was referring to packaging; correct?
A. Yes, correct. Not as related to AWSI concept because AWSI also can be packaged in other manners as well; but this is one of the concepts, which is one of the nice things one can do. Why that we can support – the technology can support it.
Q. So this was basically an example of a possible packaging option for AWSI.
A. Yes.
Q. This exhibit was not related to a specific application; correct?
A. In that sense, it's correct.
Q. Okay. At the time – I'm sorry. Let's go back to that page again. In 1984 – looking at the page we've been looking at, LEX 8543, in 1984, what was the capacity of memory that was available on the 3-inch motherboard?
MR. DeBRUINE: Objection.

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Mischaracterization.
THE WITNESS: I have not calculated it.
That's something I cannot calculate, but you can refer to the state of art in terms of 4-megabit/4-wafer RAM showing in LEX 08552.
Q. (By Mr. Yoon) Okay.
A. So the 4 megabit occupy quite a bit of space.
Q. So that was a 4 megabit –
A. For one slice – for one 3-inch wafer or depend – yeah, it's for a 3-inch wafer. Okay.
Q. Now, what was the size of the silicon in – that's shown on page LEX 8543?
A. So you probably can scale it and say roughly half an inch – no, wait a minute. One and a half inch or one inch. It's just a conceptual.
Q. And that's where my math has long failed me. I might have been able to do this once. But approximately 1 inch of memory array given a 4-megabit density for a full 3-inch wafer, approximately how much memory is that?
MR. DeBRUINE: Objection. Calls for speculation. It's irrelevant.
THE WITNESS: That is speculation, really. Because it depends – see, on this one here, this is the introductory concept, just say, hey, you know, as technology progresses, you can do more, okay.

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But I just point to you the status of the state of the art at that time in the 19 – that paper was published by the Japanese; right? Is this Japanese paper? Can you give me back the page number?
Q. (By Mr. Yoon) That is LEX 8552.
A. 8552, okay. Oh, that's definitely Japanese paper, okay.
Q. Now, with regards to a 4 megabits, that's one-half a megabyte; correct?
A. 4 megabits, if you divide it by eight – yeah, one-half megabyte.
Q. One-half megabyte. And the – it would be – less than one-half a megabyte would be actually the available memory on the 3-inch card, if you used the state of the art at the time.
MR. DeBRUINE: Objection. Calls for speculation.
THE WITNESS: That will be the state of art as represented by this particular view for which was published in 1980.
Q. (By Mr. Yoon) Yeah.
A. And it also depends on the company too, depending on what kind of technology that they really have.
Q. At the time in 1980, was 4 megabits of memory on a 3-inch wafer considered to be good?

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MR. DeBRUINE: Objection. Calls for speculation. Vague and ambiguous.
THE WITNESS: That is somewhat speculative because I was using that as an example. So it is not exceptional; it's not bad. I think, okay. It is something that somebody would like to take a look at and see.
Q. (By Mr. Yoon) Okay.
A. Because depend on the yield virtually as to how much they really have, and I don't know the yield. They probably are redundancies, a billion.
Q. So with regards to the guided missile system that's shown in Exhibit 148, on page LEX 15402, it's referred to in figure 9, I think, as the AWSI secret system. Do you see that?
A. Yes.
Q. The IO engine performed the function of data calculation; correct?
MR. DeBRUINE: Objection. Calls for speculation, lacks foundation, and is completely irrelevant to this witness's deposition.
THE WITNESS: I think that is basically a very conceptual sketch as to what we believe can be done, and it was put together in conjunction with my co-authors.
Q. (By Mr. Yoon) Now, looking at the 3-inch module

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that's shown in figure 9, how was that module mounted to the card behind it?
MR. DeBRUINE: Same objections.
THE WITNESS: There's quite different ways of doing that. This one is – we were not really funded to do it in the end, so we haven't explored extraordinary in terms of in the end, we have to find out what we had done.
Q. (By Mr. Yoon) Okay. Do you recall whether or not you did any mock-up of this device?
A. We had a mock-up of that.
Q. And do you recall whether that mock-up –
A. It was a mock-up, so it would be –
Q. Do you recall how that was connected in the mock-up?
A. It would be immaterial material because I really don't recall. Because it's a mock-up, it's different than the design.
Q. Yes. And do you recall whether or not any decision was made with regard to the decision as to how that would be affixed to that card or board?
A. We had different thoughts about how it could be accomplished; but I think that in the end, because it's not a funded program, we did not go beyond the mock-up and the conceptual design stage.
Q. Now, in the board there, there are – it appears

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to be two prongs connected to that board. They're hanging down right by the 3.15 inch.
A. Oh, the card itself is extended. It's probably called – what they call a nanphey (phonetic) card, is a high-rail packaging approach to connect the board to the system chassis.
Q. And was information transmitted through those prongs, or do you know how that was connected to the system?
A. These two are probably – if I recall correctly, these are just screw-in things, mechanical things. The connectors are on the bottom. There's nothing to tail out.
Q. Okay. Now, looking back at the device that's disclosed and discussed in the Hsia '248 patent, which is Exhibit 132, do you recall where the interface control unit was located in that system?
MR. DeBRUINE: Objection. Document speaks for itself.
THE WITNESS: Maybe you want to rephrase it.
Q. (By Mr. Yoon) Yes. You see there's a box that says, 10, which is external DPS. Do you see that?
A. Yes.
Q. That's the host computer; correct?
A. Right.

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Q. Was the interface control unit included as part of the host computer or was it separate?
A. The intention was that the interface controller, the memory stack controller, the power supply, and the memory stack is meant to be the memory system.
Q. Yes.
A. Which is something of interest.
Q. Yes. And do you recall whether or not in any of the devices that were built, whether or not those components were put onto the computer motherboard or how were they connected to the external DPS?
A. The way – the example that we used, this particular example application the interface to the customer is at 11 – item 11.
Q. Okay.
A. Okay.
Q. Now, there are boxes that shows an interface control unit, 12; a memory stack control unit, 16; the memory stack, 18. Do you see that?
A. Yes.
Q. And then a power supply, 24.
A. That's right.
Q. Now, were they – were those units connected in the example shown on a common motherboard, or were they on distinct motherboards that were connected by a bus?

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A. Maybe I can answer in this way and say that 12, 16, and the memory stack to get 24, together constitute the solid-state memory system.
Q. Okay. Now, that solid-state memory system, regarding any of those that were actually built, were there ever a system that was built that performed the function of a mass storage device where all those components were found on a single integrated circuit card?
MR. DeBRUINE: Objection. Asked and answered.
THE WITNESS: Actually, this is – would not be in a single card because the power supply is – you know, is – at the time is larger than a single card, per se.
Q. (By Mr. Yoon) Okay. But with regards to – let's just talk about the interface unit, the memory stack control, and the memory stack.
A. Uh-huh.
Q. Was there ever a system built where the function was mass memory storage where each of those blocks – that would be the interface control unit, memory stack control, and the memory stack – was there ever a system built that included all of those on a single integrated circuit card?
A. The concept was that the memory stack control

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and the interface control unit could be put together as a package, which would be in the same manner as individual memory slice. That would be one of the concepts.
Q. Uh-huh. With regards to a system that was actually built, was there ever a system built where everything was integrated into a single card?
A. This is a design.
Q. Yes.
A. It is not an end product, per se.
Q. Yes. Now, with regards to an end product, was there ever an end product built where everything was located on a single integrated circuit card?
MR. DeBRUINE: Objection. Asked and answered about a dozen times so far today.
MR. YOON: Could we have that question read back and could we have an answer. I believe the witness did answer it, but I don't know if it got reported by the court reporter. Could we have the question read back and then the witness can answer.
(Whereupon, the following portion was read back by the court reporter:
"Yes. Now, with regards to an end product, was there ever an end product built where everything was located on a single integrated

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circuit card?")
MR. DeBRUINE: Same objection.
THE WITNESS: Yes, the answer was no.
MR. YOON: Okay. Why don't we take a break. There's only five minutes of videotape left. And I will try to get organized so we can get finished up.
THE VIDEOGRAPHER: This is the end of tape No. 2. We are now off the record at 3:19.
(Whereupon, a short break was had in the deposition 3:19 to 3:39 p.m.)
THE VIDEOGRAPHER: We are now on the record at 3:39. This is the beginning of tape No. 3 in the videotaped deposition of Yukun Hsia, Ph.D., in the matter of Sandisk vs. Lexar on January 27th, 2000.
MR. YOON: Thank you. One topic I won't go into in the deposition today. I really don't want to know about the radiation effects on an MNOS device.
THE WITNESS: Actually, that is one of the driving reasons that the merger is supporting MNOS devices.
Q. (By Mr. Yoon) Like I said, don't want to know. Don't even want to think about those applications. Why don't we take a look at your declaration, Exhibit 138, please.
A. Okay.

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Q. Okay. If you take a look at paragraph 4, there is a statement that says, "One sponsored project I worked on at McDonnell Douglas was research on a solid-state replacement for the magnetic tape memory systems then employed in weather satellites."
Do you see that?
A. Yes.
Q. Other than the project with regards to the magnetic memory tape systems, did you work on any other project at McDonnell Douglas that used the MNOS SSM machine as a mass storage device?
A. Yes, for example, the design that we previously looked at.
Q. Yes. Could you state the exhibit number, please.
A. The Exhibit No. 146.
Q. Okay.
A. Would be one which is different than one that was mentioned there.
Q. And the MDAC solid-state memory development, what was the application?
A. That one is for the Navy and the Navy – I really do not know the end application, but we designed it for the Navy.
Q. And that – and that particular Navy application, that's the application that is discussed

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in the '248 patent; correct?
A. That application is related to the example used in the patent.
Q. Okay. Other than the development of a mass storage memory for weather satellites and a mass storage memory for the Navy that's discussed in Exhibit 146, was there any other project relating to the mass storage memory device?
A. I have to think about that one. Hard to recall but those are the main projects that were funded.
Q. Now, as you sit here today – and, again, these are not memory tests, but I just want the best of your recollection – are you aware of any other project where the silicon – the SSM machine was used to perform the function of a mass memory storage device?
A. We actually have a whole bunch of little projects I do. I study projects; and, for example, the silicone machine is a project that I work on myself just for fun.
And it is not funded by customer, per se; but I use the IR&D funds to support that for that different kinds of projects. And every so often, there may be customer interest in the use of memory; and then we'll make proposals and discussions. So it varies quite a bit.
Q. Do you recall building any other mass storage

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device using SSM technology at McDonnell Douglas, other than the emulation of the magnetic tape memory system or the mass memory storage system for the Navy that's discussed in Exhibit 146?
A. Not building it, per se.
Q. But one example of an application for the silicon machine was the guided system for the missile that's discussed in that article.
A. That would be one of the design studies proposals. Because in the course of trying to pursue money to fund the projects, you talk to a lot of people.
Q. Yes, I understand that. Other than the two systems that we've just discussed – that would be the solid-state replacement for the magnetic tape memory system and the SSM for that Navy application – do you recall any other end product for mass storage?
A. You know our end product sometimes is paperwork.
Q. Yes.
A. Sometimes design.
Q. Do you recall any other system that was built and marketed?
A. Not built and marketed, per se; but it probably marketed variously. I do know, for example – a good example that I recall, which I don't know whether I can reproduce the – for some of the brochures.

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We actually have stacks of wafers in the cylindrical shape, okay; and it was in one of the brochures that was sent out. So there are all kinds of different systems studied, proposed, trying to get funding on.

Q. Now, taking a look at paragraph 6, see that? And I'm going to lines 25 and 26. Do you see that it says, "rather than separate the wafer into individual chips, mount each separate chip in a package and then remount those packages and connect them on a circuit board."

Do you see that? I'm sorry. I should have read from line 24. Starting – let me just read that into the record; then I'll ask you the question.

"The idea behind WSI was to connect hundreds of such separate chips on a single wafer, rather than separate the wafer into individual chips, mount each separate chip in a package and then remount those packages and connect them on a circuit board."

Do you see that?

A. Yes, uh-huh.

Q. So is it correct to say that each MA within the SSM was a separate chip?

A. Traditionally?

Q. Yes.

A. At that time, that would be considered a chip.

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One MA is one chip.

Q. Yes. So that the SSM technology and the packaging technology associated with the SSM would be an efficient way to organize a large number of chips into a matrix that could be reconfigured; correct?

A. I guess, by and large, correct. Because the idea is, is that you want to have not individual packages because individual packages are very large, where the chip itself is very small –

Q. Uh-huh.

A. – at the time, right. They're now quite big. So that you have large number of circuit boards; and by not doing that, we think that we can achieve higher density, knowing, of course, that there's a problem with yield.

And this was – the reconfiguration and associated interconnect are to come into play as – we call it adaptive wafer scale integration.

Q. And, therefore, in, for example, the block that we discussed earlier with regards to the '248 patent –

A. Okay.

Q. This block here.

A. Yes.

Q. That would be a logical unit of memory comprised of 8 MAs; correct?

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MR. DeBRUINE: Objection. Asked and answered. Vague and ambiguous.

THE WITNESS: Not quite that.

Q. (By Mr. Yoon) Okay.

A. Maybe you want to restate the question.

Q. Okay. I believe we discussed earlier that there were 8 MAs in a block. Do you recall that?

A. 8 MAs are used for a block of data storage.

Q. Right.

A. Okay.

Q. Yes.

A. Yes.

Q. Now, those 8 MAs that are used for a block, each one of them is a separate chip; correct?

A. In the terminology of the technology at the time, that would be considered the equivalent of a chip. 1 MA would be 1 die – or one chip. If you cut them out and package them, they would be separate item.

Q. And during an erase function, each of those 8 chips would be simultaneously erased; correct?

A. If you build a system based on the package devices –

Q. Yes.

A. Are you talking about –

Q. I'm talking about with the SSM here.

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A. Oh, the SSM?

Q. Yeah.

A. The MA chips, okay, in order to – 8 MAs, okay –

Q. Yes.

A. – compose of one block.

Q. Yes.

A. Yes.

Q. And they were simultaneously erased.

A. Yes.

MR. DeBRUINE: Objection. Asked and answered.

Q. (By Mr. Yoon) Looking at the line 27 on page 3 of your declaration, it says, "In this way, numerous smaller memory arrays could be electrically connected to store relatively large amounts of data in a physically small volume."

Do you see that?

A. Yes, uh-huh.

Q. That was the advantage of the SSM technology from a packaging standpoint.

A. That's correct.

Q. In the device – the example used in the '248 patent, that system could do a block write or a sector write; correct?

MR. DeBRUINE: Objection. Asked and

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answered.
THE WITNESS: The –
Q. (By Mr. Yoon) The '248 –
A. The example – yes, you can do a block write or you can do a sector write.
Q. In operation, which command would typically be more frequently issued to the memory?
A. That I would not know because it's very much dependent on the user.
Q. Okay.
A. And some people might want to write only small blocks of data; where other people want to use large number of data.
Q. So it would depend on the program running in the computer system.
A. Yeah, depend on the applications.
Q. Okay. Why don't you take a look at paragraph 11.
A. Paragraph 11.
Q. Yeah.
A. Sure, uh-huh.
Q. And let's see. Turning back to Exhibit 137, why don't you take a look at that as well. Figure 14 was the figure that – the page that Mr. DeBruine added earlier this morning. That was the one that was stapled on.

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A. Oh, okay. It disappeared from my copy.
Q. Everyone saw me staple it.
A. The staple disappeared. Oh, right here.
MR. DeBRUINE: Let's see if we can get it to work this time.
THE WITNESS: For sure you got it now.
MR. DeBRUINE: We got enough to hold it for a little while.
Q. (By Mr. Yoon) Now, figure 14, it says, "Mock-up of slice carriers on a motherboard." Do you see that?
A. Yes.
Q. Was this figure the device that was disclosed in the other article we looked at?
MR. DeBRUINE: Objection. Vague and ambiguous.
THE WITNESS: Actually, this is an attempt, okay, to illustrate – you can build a memory, because I use MNOS as the dies and so memory – MNOS memory erase – in this particular mock-up, it shows two memory erase. And then the other one would be the memory controller; and the other chip intend to be support chips as an example to say, hey, we can build a small serial memory. That was an attempt to do that. I don't know whether that's well-articulated in the article or not.

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That's another story.
Q. (By Mr. Yoon) That's what I'm trying to determine here. They have – well, the article discusses what is called a Reconfigurable Interconnect for In-silicon Electronic Assembly. That's the title of the article.
A. Yes.
Q. Does the article discuss – let's see – let me ask you a question. I have to read this again. Okay. With regards to – why don't you take a look at figure 14, and take a look at the text on LEX 2181.
MR. DeBRUINE: Is there a part of that page?
MR. YOON: Yeah, there is. The second paragraph right above Concluding Remarks that appears to discuss figure 14.
Q. (By Mr. Yoon) Why don't you take a minute to review that, Dr. Hsia.
A. Yes. Yes, uh-huh.
Q. Now, with regards to this mock-up of slice carriers on the motherboard, in this particular mock-up, was it understood that the application would be that you would have multiple carriers that were put into the computer system?
A. Just a plug-in card, can be just plugged into a computer.

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Q. Yes. Now, would this particular mock-up – was this a complete memory system by itself, or was this the memory portion and there needed to be a second card that would have the controller logic and so forth?
A. The way it was conceived when this model was built, intention to show two memory slices plus one controller; and the controller is the square in the lower part of the figure.
Q. Uh-huh. Now, is there any statement in the article of Exhibit 137 that a controller was included on that carrier?
A. If I recall correctly, the audience for this particular conference is primary into packaging. So that aspect of the design or the concept was not emphasized.
Q. Okay. So with regards to, at least, this article, the autonomous – having an autonomous card with the controller and the memory was not emphasized in the article.
A. In the sense that it was not spelled out because the people there would not know you need a controller to control the memory chips. But on the other emphasis, anybody else who were looking at it, they would realize there's two memory arrays and then there's one large electronic unit, which must be the

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memory controller because the other's support chips. That's our original intent anyway.

Q. Do you recall whether or not there was any subsequent article or prior article that expressly discussed having a single card with the memory and controller?

A. Oh, I could look in my archive and find out; but right now, at this instant, I really cannot give you good answer.

MR. YOON: I'd just like to state for the record – and Mr. DeBruine or Ms. Byun and I will have probably several discussions – but I will request on the record that Dr. Hsia make such a search so that when his deposition is continued, we can just get it done at that time.

MR. DeBRUINE: I'll represent to you that Mr. Hsia has said he already has conducted such a search.

MR. YOON: I have no doubts about that. I'm just – my request would be just go back and check. If you have it, great; if you don't, you don't.

THE WITNESS: Okay.

Q. (By Mr. Yoon) Okay. Now, if you take a look at paragraph 12, you had a statement on lines 8 and 9 which says, "However, development of the MNOS as a

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viable nonvolatile storage medium lagged during the 1980s."

Do you see that?

A. Yes.

Q. What do you mean by that?

A. Because by the 1980s, EEPROM and all the – there's no money being spent. If we agree to extend it – or industry forecast, production, for us, MNOS is triggered to a few suppliers. And, you know, because of that and because the Government's interest is very restrictive, and the advantages that previously the MNOS has is slowly going to other than radiation hardwares. For example, the EPROMs improve and so forth and because of that, MNOS technology lags as a multi-memory.

Q. Now, did MNOS technology lack from the standpoint of memory density?

A. No, it's primary because – it's much harder – I typically tell people it's much harder for the designer to try to design MNOS compared to EPROM because one particular aspect of an MNOS device is that the memory tension, you can literally see it on the oscilloscope and in terms of transfer of the data. And it scare quite a few people in terms of memory tension, per se. On the other hand, floating

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gate is much better than EPROMs at the time.

Q. Why don't you just keep your declaration with you. Could we turn back to Exhibit 14 – figure 14 of Exhibit 137 – that's the article – for one second.

A. Oh, uh-huh.

Q. I believe you used the term "mock-up" with regards to this figure.

A. Yes.

Q. Did you ever build a working version?

A. This is mock-up.

MR. DeBRUINE: Objection. Asked and answered.

Q. (By Mr. Yoon) Other than military applications and applications of government systems, are you aware of any type of silicon machine or MNOS mass memory device that was commercially successful?

A. Let's put it this way: MNOS memory erase devices were actually marketed and were put on the commercial market for sale by the industry and also by Nytron and many applications were – our products were built based on those.

Q. Yes.

A. And, of course, the customer base is reasonably large that I really don't know how they used those devices.

Q. Uh-huh. But for various reasons, floating gate

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EEPROM technology supplanted the MNOS technology in many applications.

MR. DeBRUINE: Object. Assumes facts not in evidence. It's vague and ambiguous.

THE WITNESS: I guess maybe I can state another way. To say that by the early 1980s, it is pretty clear that EPROMs have greater production volumes than MNOS. On the other hand, I do know that at least – I do not know – since they are my competitors – that MNOS were used in borrowed memory, which is, in the end, in essence, is a serial memory and that was done by Westinghouse.

Q. (By Mr. Yoon) Now, if you take a look at paragraph 16 of your declaration –

A. Okay.

Q. – where it says, By June of 1984, I had conceived of a memory system that could be mounted on a removable card that, when connected to a host computer, would act – would operate exactly like a disk drive.

Do you see that?

A. Which one is that one?

Q. Sorry. Starts on page – paragraph 16, line 27; and the sentence ends on the next page, two lines down.

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A. Okay. Uh-huh. Yes, uh-huh.
Q. And I think we had a discussion regarding Exhibit G. Why don't you turn to that page. I think it's 8543.
A. Yes.
Q. Now, that particular device, that 3-inch card there, that was not actually used as a memory system; correct?
MR. DeBRUINE: Jim, that's asked and answered. This has got to be 15 times now. Can we, please, move on with this witness to questions you haven't asked and try and wrap this deposition up.
Q. (By Mr. Yoon) You can answer the question, Doctor.
MR. DeBRUINE: Next time, I'm going to instruct him not to answer; and I'm going to end the deposition.
THE WITNESS: This one here is introductory page to a long lecture, is meant to be a general representations, can be a memory, serial memory. It can be a computer. It can be – it's just a general representations, okay.
Q. (By Mr. Yoon) Yes. Now, Dr. Hsia, looking at paragraph 17 of your declaration, and there are multiple bullet points –
A. Yes.

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Q. – did you ever build the device that possessed all the characteristics of the bullet points listed in the declaration?
MR. DeBRUINE: Jim, can we, please, move on to a question you've not asked this witness more than a dozen times. He has told you exactly what he has done and what he has and has not built.
THE WITNESS: We did not build, per se, a system.
Q. (By Mr. Yoon) Uh-huh.
A. **But we have designed and we have proposed designs and based on which the patent was written, in a sense, with different designs and different considerations of how they can be built.**
Q. Thank you, Dr. Hsia. I have only one or two more questions.
A. Sure.
Q. Dr. Hsia, and I understand that, you know, given the documents that you've looked at today, the exhibits, is there a single document that discloses all the characteristics of the bullet points of paragraph 17?
A. **A single document –**
MR. DeBRUINE: Object as vague and ambiguous, and the documents speak for themselves.
THE WITNESS: It's difficult to answer

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your question because you really will have to look at the document and determine yourself whether they include all of them or not. I'm looking at the overall concept. I'm not trying to tie it to a particular document, other than the fact that – pretty much you mentioned it mentions pretty much what is covered in the declaration, as far as I'm concerned.
Q. (By Mr. Yoon) Okay. Well, let's see. Let me just take a look at my notes.
MR. DeBRUINE: Okay. Sure.
THE VIDEOGRAPHER: Do you want to go off the record?
MR. YOON: Why don't we just take a minute to go off the record, so there's not a lot of blank tape.
THE VIDEOGRAPHER: Okay. We are now off the record at 4:15.
(Whereupon, a short break was had in the deposition from 4:15 to 4:18 p.m.)
THE VIDEOGRAPHER: We are now on the record at 4:18.
Q. (By Mr. Yoon) Okay, Dr. Hsia, hopefully, we can get you home. I think – I wanted to ask you a couple quick questions. Looking at paragraph 9 of your declaration –

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A. **Paragraph 9, okay.**
Q. I'm sorry. It's actually the last sentence of paragraph 8. It said, The memory stack controller maintained a RAM table providing the nonvolatile memory block address for each logical block address. Do you see that? – each logical address. Do you see that?
A. **Yes. Okay, fine.**
Q. And then if you take a look at line 12 of that same paragraph, it says, "The conversion mapping is designated as a control function."
A. **Yes.**
Q. Is it correct to say that the memory stack controller of the device disclosed in the '248 patent maintained a memory map that converted the disk drive address into a physical address on the memory stack?
MR. DeBRUINE: Objection. Document speaks for itself. Incomplete hypothetical.
THE WITNESS: I guess it depend – see, the mapping is a conversion.
Q. (By Mr. Yoon) Okay.
A. **Okay. And indeed, okay, is converting the disk memory address to an address, which in the end, points to the AC that points to the MA.**
Q. Okay.
MR. YOON: Dr. Hsia, thank you very much,

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sir. I know this was your first deposition and, although, we'll discuss it with counsel, I do want to thank you for your patience. I know this was a long day.

MR. DeBRUINE: I actually have just a couple of questions.

MR. YOON: All right.

MR. DeBRUINE: It's a third-party witness, Jim. I'm perfectly entitled to ask him a couple questions.

MR. YOON: It just came out of the blue, that's all. I was contemplating my beer.

MR. DeBRUINE: Believe me, no one wants it more than me.

EXAMINATION BY MR. DeBRUINE

Q. Dr. Hsia, can you, please, take a look at what's been marked as Exhibit 137 –

A. 137.

Q. – which is the 1982 –

A. Sure.

Q. – article. Earlier at page 2181 –

A. Which one is –

Q. – I believe Mr. Yoon had asked you some questions about the paragraph in the right-hand column that begins, "an alternative approach."

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A. Right, uh-huh.

Q. Do you see in that – that very long sentence, it refers to mounting interface circuits which are used as system glue in the case of complex electronic system assemblies?

A. Yes.

Q. Okay. Can you, please, turn to page 2178.

A. 2178, which is in front, uh-huh, okay. Yes.

Q. In the left-hand column in the paragraph that's headed "the solid-state MNOS memory" –

A. Yes.

Q. – do you see the sentence that begins, "An interface controller is used specifically to provide for the emulation of existing disk memory interface and a memory stack controller is designed for efficient implementation of memory stack control"? Do you see that?

A. Yeah, can you point to me –

Q. Right there.

A. Oh, I was looking at the – oh, okay. Yes.

Q. Do you see the reference there to an interface controller and a memory stack controller?

A. Yes, uh-huh.

Q. Would an electrical engineer reading this paper understand the interface circuits referred to on page 2181 to encompass the interface controller and the memory stack controller?

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THE WITNESS: Yes.

MR. YOON: Objection. You can answer but I get to object this time.

THE WITNESS: Okay.

MR. YOON: Objection. Incomplete hypothetical. Calls for expert testimony. Calls for speculation. So if we could have the question read back and then the witness can provide his answer.

THE WITNESS: Yeah, the system grew – basically, is a generic statement saying that, you know, you encompass, of course, an interface controller is part of the system controller.

MR. YOON: Mr. DeBruine's questioning, so I don't know if he's done or not.

Q. (By Mr. DeBruine) You can still direct your answers to the television camera.

A. Oh, okay.

Q. Can we take a quick look at Exhibit 143, which is entitled Wafer Scale Integration, Exhibit G to your declaration.

A. 142 – 143, okay, sure.

Q. This one.

A. Uh-huh.

Q. And at page – the page that's marked LEX 8543 –

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A. 85 –

Q. – it would be the third – fourth page of the document.

A. Oh, we've been talking about this one here.

Q. And the title refers to – of this page says, AWSI Packs More Components and Functions Into a Given Volume; is that correct?

A. Yes, that's correct.

Q. And it shows mounting – in the AWSI system, mounting chips on a single card.

A. Yes.

Q. Is that correct?

A. Yes.

Q. And I believe you testified earlier that this was meant to be a generic illustration of implementation of AWSI.

A. Yes. Actually, it was used as advertising view foil by the marketing people even.

Q. Okay. Was one of the concepts – one of the applications for your AWSI concept disclosed during this lecture: A Solid-state Memory System?

A. Yes. I guess you can refer to subsequent pages.

Q. Let's find –

A. The silicon machine, particularly, which would be on LEX 08581.

Q. If we can actually look at 8553.

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A. 8553. It get – 53. Okay, yeah.
Q. Is that the title of a paper that you've published?
A. Yes.
Q. Okay.
MR. YOON: One second, Sean. I haven't got to that page. I get to object. So, Dr. Hsia, you can wait a second, if I have a problem. Go ahead, Sean.
Q. (By Mr. DeBruine) Is that a title of a paper you co-authored?
A. Yes.
Q. And what was the purpose of displaying the title of this paper during this lecture?
A. Because it discusses the use of mass memory, and that refer to a paper which I presented in Japan. And my assumption when I put that down, also, was that that probably was one of the reasons that maybe I got invited to China was at this conference, I ran into some Chinese scientists, engineers. And I thought that, you know, since I already discussed that, I might as well remind them that I'm dealing with wafer scale integration and mass memories. And I think that's the same paper, if I recall correctly, that had detail error correction, EDAC, in

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that paper, which is – actually is attended by a lot of people worldwide.
Q. Do the pages from 8553 through 8573 – excuse me – 8574 generally describe your concept of a semiconductor mass memory?
A. 85 –
MR. YOON: – 73, I think he said.
MR. DeBRUINE: 74, actually.
THE WITNESS: 74.
Q. (By Mr. DeBruine) From 8553 to 8574.
A. Yes, yes, yes, yes, yes. Of course, it encompass several papers and several source materials; but that's basically the general idea of the mass memory.
Q. Okay. Based on the number of pages dedicated to the mass memory system, is it fair to say that a large part of your lecture encompassing these notes were describing the mass memory system?
MR. YOON: Objection. Mischaracterizes the witness's testimony. Document speaks for itself.
THE WITNESS: I guess the answer is yes. Because at that time, that's the easiest thing to do; even though I was very ambitious, try to do other things. Being able to do a mass memory that replaces disk memory, would be, I think, near turn achievable objective at the time.

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Q. (By Mr. DeBruine) And at page 8568 and 8569 –
A. 568, 569. Yes.
Q. Do you see – those are figures from the '248 patent we've been discussing today; is that correct?
A. That's correct.
Q. And what was the purpose of including those figures in your lecture notes?
A. That is the mass memory that, you know, I was describing to the audience and get people interested in it.
Q. Okay.
MR. DeBRUINE: That's all I have. Thank you.
MR. YOON: Couple just very quick questions, Dr. Hsia.
EXAMINATION BY MR. YOON
Q. Looking at the pages that Mr. DeBruine had just pointed to you, page 8568 and 8569 –
A. Yes.
Q. – they were extracted from the '248 patent; correct?
A. Yes.
Q. Would you take a look at figure 5 of the '248 patent.
A. Figure 5 of the patent.
Q. Of the patent.

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MR. DeBRUINE: It's Exhibit 132.
THE WITNESS: Okay. Okay.
Q. (By Mr. Yoon) That figure was not disclosed in Exhibit 143; correct, or included in 143?
A. 143. Yes, okay. That one was doing precisely because it's just a Xerox copy of that.
Q. My question wasn't clear. So let me just ask it to you again. Figure 5 of the '248 patent was not included in your presentation, which is Exhibit 143, which was Exhibit G to your declaration; correct?
A. Would you repeat the question again.
Q. Figure 5 of the '248 patent was not included in your presentation of Exhibit 143; correct?
A. Oh, that's correct.
Q. And figure 5 is the only figure in the '248 patent that shows the use of an EDAC; correct?
MR. DeBRUINE: Objection. Document speaks for itself.
THE WITNESS: In the sense of what is given here, yes, okay, figure 5 is not included in the lecture material that was provided.
Q. (By Mr. Yoon) One brief question, Dr. Hsia. Regarding Exhibit 137, Mr. DeBruine asked you some questions regarding glue and the interface circuits. Do you recall that?
A. Yes, he did ask me that question.

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Q. And –
A. I'm looking for the paper.
Q. Oh, I'm sorry.
A. Okay, go ahead.
Q. If you look at figure 14, that mock-up –
A. Yes.
Q. – do you know whether or not that mock-up – controlled circuitry in that mock-up was the memory stack controller, was the interface controller, or both?
A. Okay. This – as you look at this three large packages –
Q. Yes.
A. – two of them we show memory arrays and then this other large one –
Q. Yes.
A. – basically is the memory controller.
Q. Okay.
A. That control – that has the interface circuits as well as the memory stack controller circuits and then the other chip just supports circuit chips is the glue.
Which, in a sense, you can look at the lower half of package as the system glue because you have tied the memory to the system and then we call that system glue.

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MR. YOON: Okay. I have no further questions, subject to my caveat about bringing Dr. Hsia back.
THE VIDEOGRAPHER: This is the end of tape No. 3 and concludes today's proceedings. We are now off the record at 4:33.
(Whereupon, the deposition was concluded at 4:33 p.m.)

YUKUN HSIA

Subscribed and sworn to before me
this day of , 1998

Notary Public in and for the State of California, County of Santa Clara

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DATE: February 4, 2000

TO: Dr. Yukun Hsia
c/o Sean P. DeBruine
Fenwick & West LLP
Two Palo Alto Square
Palo Alto, CA 94306

RE: SANDISK vs. LEXAR MEDIA
DATE TAKEN: January 27, 2000

Dear Dr. Hsia:

The original transcript taken in the above matter has been prepared and is available at our office for reading, correction and signature.

Your rights re signature of deposition are contained in the Code of Civil Procedure, Section 2025 (q).

Unless otherwise directed, your original will be sealed after thirty days from today's date.

If you wish to make arrangements to review this original, please contact our office during regular office hours, 9:00 to 5:00, and make an appointment to review the transcript.

Sincerely,

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